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The ELECTRICAL REVIEW

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Advertisement Index, see page lvi. *Official Notices, see Sup. 36.*

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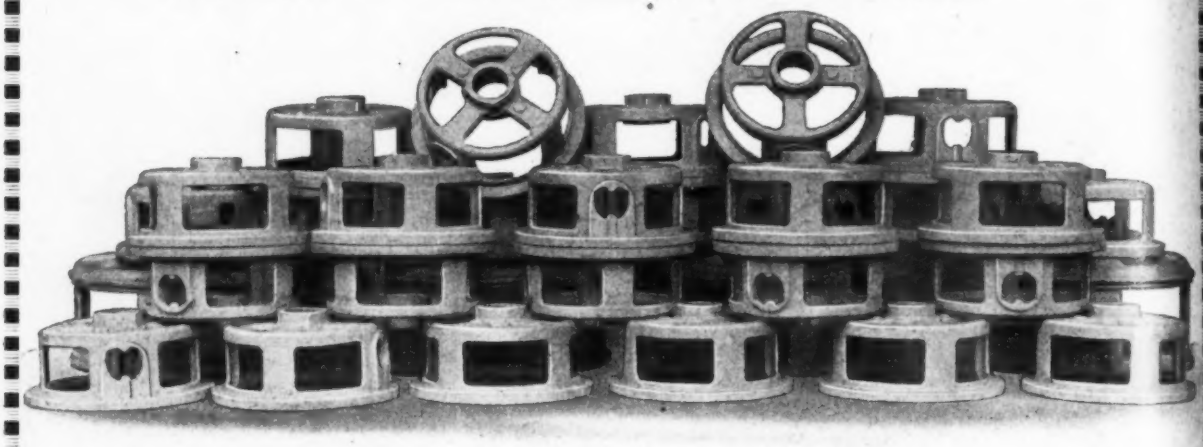

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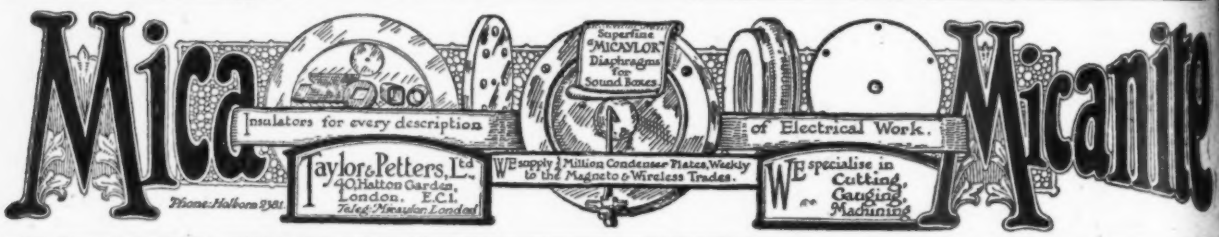
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The

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LIST OF FOREIGN AGENTS (see first page "Official Notices").

Contents:

	PAGE
On Doing Electrical Trade Abroad	441
International Co-operation	442
The Post Office and Automatic Telephones	443
Popular Electricity at Olympia	443
The Neutral Wire on a Three-wire System, by John H. Parker (*illus.*)	444
Plate Aerials for Wireless Reception, by C. F. Mackness	446
Anti-friction Bearings for Electric Motors, by C. H. S. Tupholme (*illus.*)	447
The Large Water-tube Boiler, by P. W. Robson	448
Legal	449
Business Notes	449
Lighting and Power Notes	455
Tramway and Railway Notes	456
Telegraph and Telephone Notes	457
Radio Notes	457
Contracts Open and Closed	458
The Electric Driving of Large Cotton Spinning Mills (*illus.*)	459
Power-House Pets—and Pests	462
Forthcoming Events	464
Notes	464
Institution Notes	466
Our Personal Column	466
New Companies Registered	467
Official Returns of Electrical Companies	467
City Notes	467
Stocks and Shares	469
Market Quotations for Chemicals and Metals	470
The Austrian Electrical Industry	471
The Electrical Imports of Czecho-Slovakia	471
New Electrical Devices, Fittings, and Plant (*illus.*)	472
The Post Office and Automatic Telephones, by Col. T. F. Purves (*illus.*) (*concluded*)	473
The Ideal Home Exhibition—III (*illus.*)	475
Exports and Imports of Electrical Goods and Machinery in February, 1925	477
Electrical Development in Residential Areas	477
Parliamentary	478
Correspondence—	
German Terms	479
Lead-covered Wiring and Visible Bonding	479
Low-fall Hydraulic Turbine Installations	479
Russian Electrical Notes	479
Published Specifications	480
Contractors' Column	Advertisement page xxxvi

On Doing Electrical Trade Abroad.

SWEEPING criticism of British electrical manufacturers appears in a report prepared by the representative of the Federation of British Industries in Porto Alegre, Brazil. It is published in *British Industries*, the official organ of the Federation, an organisation with which, of course, the British Electrical and Allied Manufacturers' Association is connected. The critic says that the electrical industry in Rio Grande do Sul is practically in the hands of the Germans, "largely because British firms have absolutely neglected this market and only attended spasmodically to inquiries sent them by local firms." Formerly when observations of this kind were made in the trade Press, based upon the first-hand information vouchsafed by those in close touch with foreign markets, the statements were sometimes received with incredulity or as the vapourings of those who had to say something. Consular officials, commercial attachés, and even Trade Commissioners, when they passed similar strictures, as they often did, were not treated seriously. The present report is in a quite different category, for it is the work of a representative of the British manufacturers themselves who is in Brazil, presumably making a personal study of the situation, and therefore less open to the belittling suggestion that he is passing on somebody else's views.

Criticism of such a kind is of value—whatever its origin and by whomsoever passed on—if it is not limited to generalisations. It should reflect the situation in such a way as to indicate the shortcomings so that those who wish to do so may profit from their avoidance in future. Let us see, then, what the F.B.I. reporter at Porto Alegre has to say. We may pass over the first point, which shows that the bulk of the house and shop fittings on the market are of cheap and dangerous German types, because, with the best interests of British reputation for quality at heart, nobody could urge our manufacturers to make anything for

any market which would be dangerous because it was cheap. It is gratifying to note that a campaign in favour of better quality is on foot. To be as low-priced as is compatible with a reasonable standard of quality is the end for which our firms are striving, and with increased production the position in this respect should improve. The second point raised calls for closer study, for, while it is a matter of prices, quality questions do not arise, the competitive plants mentioned being "on an equal basis as regards specification." It is stated that for several orders recently placed for dynamos and a.c. generators, the British quotations were practically equal with the German, and were cheaper than the U.S.A. and the Italian figures. It was purely because of their much easier terms of payment that the Germans were in the superior position. "They always ask one-third with order, one-third against shipping documents, and the remaining third 120 days later; but on an important order will grant up to two years' terms." The British terms are one-third with order and the remainder against documents in London, "which clients here will *never* accept."

We can hear some saying: "This is an old tale; tell us something new!" It is indeed a very familiar story—hoary with age—but there are many indications that it is still true and is a sufficiently serious factor to call for consideration anew. It is the definite export trade policy of Germany consistently and persistently pursued. As we remarked only a fortnight ago, at the very moment when Germany is borrowing large sums abroad, her manufacturers, because of their close relations with financial organisations which back up industrial effort to their utmost ability, are able to give long credit in export markets. Have our British electrical manufacturers lately put their heads together with the determination to take strong concerted action? We have in recent years witnessed the setting-up of a number of joint financial and industrial concerns which have enabled foreign operations to be conducted, but their existence does not seem to have altered the position for the rank and file of manufacturers and traders so that they can counter the long-credit weapon of the German trader.

There is a ring of familiarity about the next point of the criticism. It relates to the German method of holding large stocks of electric motors, dynamos and fittings and having fitters always available to attend to the erection or repair of any machinery that may be bought. Frequently this ability for immediate execution of orders and technical work in connection with them takes business in a German course, though the price is higher. The Siemens-Schuckert S.A. is credited with having secured probably 90 per cent. of the available orders during the past three years owing to this advantageous procedure. Our competitors, too, derive particular benefit from the fact that they do not limit their operations to trade in electrical machinery, but they sell machine tools, portable steam engines, and other lines which also are needed by the purchasers of electrical equipment. They do this through what is described as "an excellent combination of *non-competitive* agencies direct with the factories," each manufacturer represented furnishing stock on consignment and paying his share of the overhead expenses. Co-operative action of this kind enables an effective technical organisation and showroom to be economically run.

There are other interesting points in the report before us, but the main idea that remains with us after reading it is its emphatic tribute to, and argument for, combination or co-operation in the foreign field. It may be thought that Rio Grande do Sul does not matter much, but it should be remembered that Brazil as a whole matters a great deal; it is one of the great developing world markets, with infinite natural resources waiting to be utilised, and its electrical requirements will grow immensely. Already there are five German combinations established in Porto Alegre "all doing good business" "without a single British competitor," for Germany recognises that Rio Grande do Sul is no insignificant spot, but is a State two-thirds the size of France.

It is unnecessary to record all the efforts that British electrical and allied manufacturing companies have made during the past ten or fifteen years for co-operative selling along well-defined combination lines in Egypt, in Russia, in China, in Canada, in Australia, and so on. But for the war we should have heard a great deal more of some of them. The measure of success may not have been great in some cases, while in others, due to specially adverse conditions, failure has to be admitted, but, generally speaking, "the value of combination of firms has been amply proven," as the F.B.I. representative remarks. It is a practice essentially applicable to foreign parts where the immediate prospective business is hardly sufficient to justify individual action and certainly not enough to warrant competition between similar British firms. The grouping of non-competing firms in one strong combination seems to be the right thing. Our firms know well enough how to do it, they need little tuition, but for some reason—no doubt a very good one—their operations have left Rio Grande do Sul alone up to the present.

The report leaves one wondering whether the time is not ripe for some fresh study and some bold action to cover ground that is still receiving too little attention. The strong grouping scheme should afford a solution to the long-credit problem and it should also simplify the holding of adequate stocks abroad.

International Co-operation.

In reviewing recent tendencies in connection with international electrical relations in our issue of February 27th (p. 321), we suggested that these might have to be regarded as part of a new order of things which would emerge as the more or less inevitable outcome of changing world conditions. We felt that the course events were taking called for the encouragement of an attitude of mind which would enable industry to accommodate itself to proposals for readjustment of policy. It is plainly obvious from the speech delivered by Sir Eric Geddes on retiring from the presidency of the Federation of British Industries that our judgment of the position is also that of other responsible students of world developments. We can imagine that to those who are unable to reconcile their mentality to the influence of change, certain of Sir Eric's suggestions would be painfully startling. We allude particularly to that part of his excellent review in which he examined ways that were open to the Federation, to separate trade associations, and to individual firms, for helping to bring about economic restoration of the world, to increase the purchasing power of all markets, and to bring back prosperity to all industrial peoples. The "startling" idea promulgated is that a forward step should be taken as "a new though perfectly logical development of our previous work" by "endeavouring to get into closer touch with our fellow manufacturers in the other principal industrial countries of the world, with the object of discussing with them, and if and where possible co-operating with them in any matters which may promote what is to our general interest: the expansion of world trade as a whole." Sir Eric gave reasons why the initiative in the matter should come from British industrialists, the leading one being that international trade plays a greater part in our industrial life than it does elsewhere. He recognised that he was suggesting a "great new experiment" full of possibilities for good, but also, "if unwisely or tactlessly dealt with," full of possibilities of evil; therefore, he urged cautious going, the avoidance of matters of controversy, and the limitation of first attempts to consultation with the industrialists of one other country at a time, leaving aside for the present any ambitious project for a more general con-

ference. In any such discussions it has to be recognised that patriotism will dictate to the citizens of any country that they shall put their own national interests first; also that whatever may be possible in some directions there must of necessity always be keen competition. The great thing is to avoid controversial questions and to concentrate primarily on the big problem which faces all industrialists, "What can we do to expand the trade of the world?" and in thus aiming "What action can we take which will promote our common interests?" It may be that such an atmosphere would at a later stage enable the most controversial matters to be discussed in a friendly way, even questions upon which national interests are keenly opposed. The first step, it is thought, could be taken by the Federation initiating consultations with the producers and manufacturers of the Dominions. As our readers are well aware, many works have been established in various British Colonies to the detriment of the export trader in the United Kingdom, and not always to the immediate cost advantage of the consumer overseas; this follows upon the ambitious industrial policy of Australia and South Africa, which can only succeed if production can be carried out on a large scale, the output being absorbed by contiguous export markets. The Canadian market is different from either of these. Canada is becoming more and more an industrial manufacturing territory, and in some respects a powerful export competitor. Here we seem to be in touch with a matter which might well be amicably considered in conference between British Home and Dominion industrialists.

Those who are deeply interested in such matters will read the speech in its entirety with its references to the disturbed equilibrium in all countries; to the unhealthy speculative price-cutting; and to our inability to tell whether the Dawes plan is going to be of benefit to us in reparation or is going to start a more intense competition with the recovery of Middle Europe. At present "the industry and trade of the world are demoralised—are out of balance" due to the "forces of disorganisation which were left by the war." Industrial peace is essential for efficient and economic production, but world demand must be increased and the Geddes proposal for international co-operation is advanced partly with that as its ultimate objective.

The proposition is extremely interesting, and in our judgment most timely. It will be for electrical and allied men to consider of what utility it can be in connection with the very important British industries whose interests they have at heart.

The Post Office and Automatic Telephones.

The masterly paper that Col. T. F. Purves, Engineer-in-Chief to the Post Office, read before the Institution of Electrical Engineers on the 5th instant (an abstract of which is concluded in this issue) has a wider circle of interest than even the very large audience that attended. The present position and policy of the Post Office with regard to automatic telephony emphasise the important work that it has performed in building up a national industry, for the British telephone manufacturing industry is a direct outcome of Post Office policy, and the annual value of telephone manufactures produced in this country now runs into the tens of millions sterling. It will be agreed that the Post Office has performed a great national service in this respect.

Although for various reasons the present telephone development of this country is below what should, and could, be achieved, the progress that is being made is gratifying. In October, 1922, the number of subscribers' telephone stations in Great Britain reached one million, and new stations were being added to the system at the rate of about 5,000 per month. The number has now increased to 1¼ million stations, and new subscribers are being connected at a rate representing a net increase of about 10,000 stations per month. In other words, the system has increased by 25 per cent. in 2½ years, and the rate of increase has, itself, doubled in that period. There is no sign of a diminution in the rate of growth, and the recent formation of the Telephone Development Association to undertake publicity will tend, of course, to hasten it.

Mr. G. H. Nash, in the discussion on Col. Purves's paper, drew attention to the fact that there was no mention therein of the large amount of research and the numerous "studies" that had been necessary on the part of the Post Office staff before a standard could be adopted. In view of the very extensive organisations in the United States that have been in existence for some years for the purpose of dealing with this kind of work, it is only just that the work performed by the Post Office in this country should be recognised. The Post Office, in dealing with the position here, has in some respects a more difficult task than have the American telephone companies in that the Post Office policy has been to encourage a number of *different* manufacturers with a view to securing competitive contracts, whilst in the Bell system one firm manufactures the bulk of the plant. That being so, it is necessary for Post Office engineers very definitely to specify the requirements that have to be met, and to do so in a way that will not hamper particular manufacturers. It follows that the Post Office staff must act as arbitrators in selecting schemes put forward by the different manufacturers, and to do so it has been necessary to build up a body of experts able to express authoritative views and to secure manufacturing co-ordination. This has had a general beneficial effect in that the Colonies and other telephone administrations repeatedly order telephone equipment in Great Britain to Post Office specifications, being satisfied with a product that has the approval of the British Post Office. A measure of standardisation has been achieved that is somewhat surprising, but Col. Purves was careful to point out that the standardisation already accomplished had nothing to do with any ideas of finality or fixation of practice; improvements emanating from any source in future would be introduced if the public service would benefit thereby.

An important point in connection with the introduction of automatic equipment is the necessity for maintaining a highly-skilled staff for the operation of the plant; without this skill the policy will fail. To meet this need, it has been found necessary to set up a very completely-equipped training school in London which is intended to cover, not merely the theory, but also the practical side of automatic telephony.

Popular Electricity at Olympia.

The electrical industry is to be congratulated upon the excellence and general effectiveness of the Electric House exhibit of the Electrical Development Association and the Electric Lamp Manufacturers' Association at the Ideal Home Exhibition. In the space at their disposal a better show could not have been made. The roof garden makes an appeal to the imagination and to the artistic instincts by reason of its smokelessness and floral beauty; inside the various apartments, with the aid of capable demonstration and explanation, the numerous electrical contrivances convincingly satisfy the housewife's eagerness for utility, convenience, and labour saving; and the important comparisons of good and bad illumination are effectively present everywhere. Of the popularity of electrical demonstrations of this kind with the general public, the Olympia Electric House is one more substantial proof. Down to Monday last as many as 500 persons per hour had been passing through the rooms since the opening day, and the number will hardly be less from now until the closing on the 25th inst. The design of the exhibit is very attractive, and it would be a good thing if the whole demonstration could be lifted *en bloc* and dumped down upon a popular spot where everybody could see it at Wembley during the coming summer. If the electrical industry would find the means for doing this it could rest assured that it would be making an investment which would yield a huge dividend.

E

The Neutral Wire on a Three-Wire System.

By JOHN H. PARKER.

The Board of Trade Regulations stipulate that "Where the pressure of supply between the adjacent conductors of a three-wire system of mains exceeds 125 volts, the intermediate conductor shall be connected with earth, subject to the concurrence of the Postmaster-General and in accordance with the following conditions:—

(a) The conection with earth of the intermediate conductor shall be made at one point only on each distinct circuit, namely, at the generating station, sub-station, or transformer, and the insulation of the circuit shall be efficiently maintained at all other parts.

(b) The current from the intermediate conductor to earth shall be continuously recorded, and if at any time it exceeds one-thousandth part of the maximum supply current, steps shall be immediately taken to improve the insulation of the system."

The methods adopted by electricity undertakings to comply with the above regulations vary in details of arrangement and also with the system of supply.

Direct-Current System.

A typical arrangement of this "earth" panel is shown in fig. 1. From the diagram it will be seen that the neutral busbar is connected to a good earth, usually

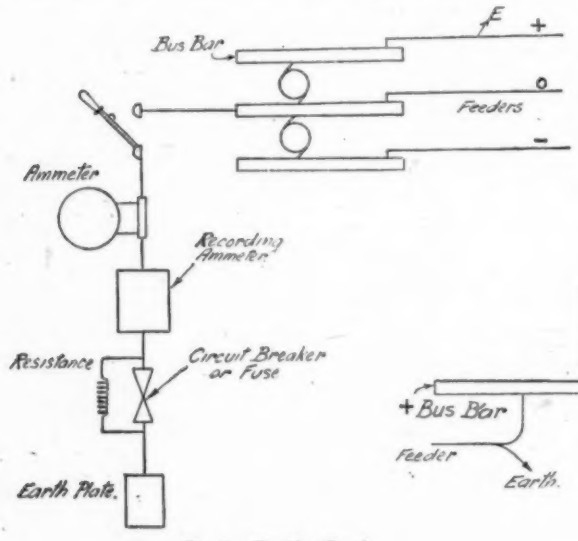


Fig. 1.—Earthing Panel.

a copper plate buried in moist ground, and the circuit includes a central-zero ammeter as well as a recording ammeter for keeping a continuous record of the earth leakage.

If a partial breakdown of the insulation of a cable were to take place in either outer conductor, as indicated at the point E in fig. 1, a current would flow to earth at this point, and a corresponding amount would flow back to the generator by way of the earth plate in the neutral panel, and would be shown on the ammeters of this panel.

If the breakdown of the insulation of an "outer" were complete, the machine connected between the side of the system affected and the neutral wire would be short-circuited, as both terminals would be connected to earth. To prevent an undue flow of current through the machine, it is customary to put a circuit breaker in the earth circuit with a resistance or bank of lamps connected across the breaker, so that when an "outer" goes to earth and the resultant current reaches a predetermined amount, the circuit breaker operates and automatically throws the current-limiting resistance into circuit.

For example, in a 250-volt circuit the resistance would be set for 10 ohms, so that the maximum current could not exceed 25 amperes. The circuit breaker would also be set to operate just below 25 amperes, so that a 25-ampere scale on the recording ammeter would give sufficient range for ordinary requirements, but very often the resistance is made adjustable so that the current flowing through a fault can be varied to burn out the fault, so the indicating ammeter requires a longer scale.

Fig. 2 shows a very easily-constructed earth detector, which gives interesting information concerning the distribution of pressure between the "outers" and earth during a fault.

The detector consists of four lamp-holders mounted on a board, wired in series with each other, and connected across the outers of the three-wire system. A wire is taken from the middle point between the second and third lamp holders and connected to a good earth, but not the neutral busbar. Carbon-filament lamps are the best to use for the detector.

It will be evident that as long as there is no leakage on the three-wire system and the neutral busbar is at earth potential, the filaments of all four lamps will glow a dull red, since each pair of lamps is connected across the voltage of one side of the system, and each lamp is therefore getting half voltage. If, however, a dead earth came on, say, the positive side, the two lamps connected between the positive bar and earth would cease to glow, and the two lamps connected between the negative bar and earth would burn with full brightness. The reason for this will be evident from a consideration of fig. 2.

Since there is a dead earth on the positive side, the breaker on the neutral-wire panel will be open and the

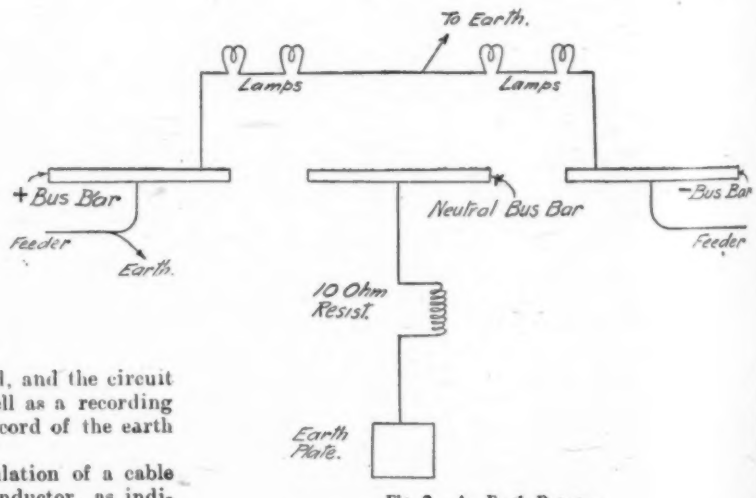


Fig. 2.—An Earth Detector.

resistance will be switched into the earth circuit to limit the flow of current.

Suppose the normal voltage across each side is 250 volts and the earth resistance is 10 ohms, so that the maximum current that can flow with a dead earth on an "outer" is 25 amperes.

To force this current from the earth plate through the 10-ohm resistance to the neutral busbar requires a pressure of 250 volts, and as the positive cable, and therefore the busbar, is dead earthed, the neutral bar with the resistance in circuit is 250 volts below earth pressure. As the negative bus-bar is maintained at 250 volts below the neutral busbar, the negative busbar will be 500 volts below earth pressure, so that the two lamps in the detector connected betwen earth and the neutral busbar will have 500 volts across them, and each

lamp will get 250 volts, and they will burn with their full brightness, while the two lamps connected between the positive busbar, which has been dead earthed through the fault, and the middle point of the detector which is connected to earth, have no pressure across them.

If only a partial earth had occurred, a similar result would have been obtained: the lamps on the positive side would have burnt dimmer and those on the negative side brighter. For example, if the leak through the fault was limited to five amperes, the e.m.f. required to force this current through the 10-ohm resistance would be 50 volts, so that the neutral busbar would have been 50 volts below earth, and the negative busbar, which was 250 volts below the neutral busbar, would have been 300 volts below earth; therefore the two lamps on the detector between the positive bar and earth would have had 200 volts across them, while the pair between the negative busbars and earth would have had 300 volts across them.

This detector is extremely handy when looking for earths. If the earth is believed to be on the consumer's premises, say some large works, because the earth corresponds with working hours, the resistance is inserted in the middle-wire circuit, the detector is connected across the consumer's cut-outs, and the middle point of the detector is earthed; by arrangement with the consumer, either main switch or section switches

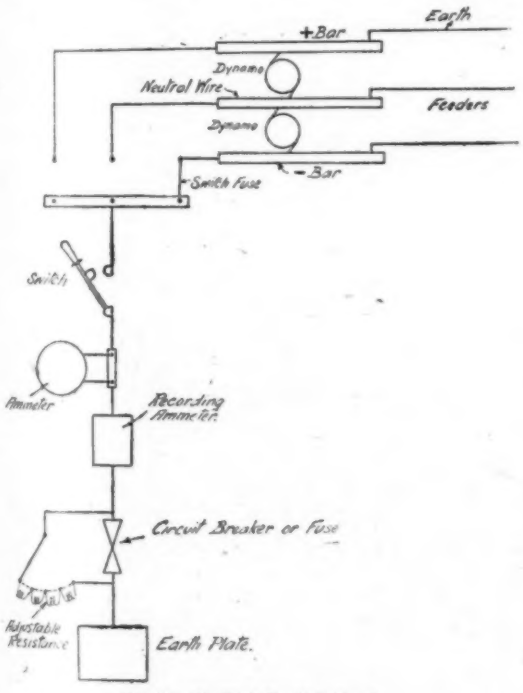


Fig. 3.—Modified Earthing Panel.

are pulled out one at a time; the moment the circuit that contains the earth has been disconnected, all four lamps of the detector will glow with the same dullness.

Fig. 3 shows a modification of the arrangement of the earth panel, which is very useful for dealing with slight leaks, which are difficult to locate because of the smallness of the current.

A three-way fuse-board, arranged for heavy switch fuses and having a common busbar on one side, is placed in circuit as shown. Each fuse circuit is connected to one of the busbars of the three-wire system, so that each busbar can be connected to the earth plate by inserting the fuse holder in that circuit. Only one fuse holder, however, is provided, so that it is not possible to connect two bars at the same time to the earth plate. The fuse holder, which acts as a disconnecting link and not a fuse, is normally in the neutral circuit.

If a small steady leak develops, say, on the positive side, and the current is too small for testing purposes, the switch shown in fig. 3 is opened, and the fuse holder on the middle wire pulled out and inserted in the negative busbar circuit. When the switch is closed, the middle wire will be 250 volts above earth and the positive 500 volts above earth pressure, and double the current is forced through the earth.

Some engineers are rather doubtful about earthing one of their "outers" for a very short time; it certainly subjects the opposite side of the system to double the pressure to earth that it has to stand under normal conditions, but all installations are tested at double pressure before connection, and it is not too much to expect them to stand the same pressure now and again when looking for faults, especially as a bad fault on one side automatically subjects the other side to excess pressure and no one worries.

Apart from subjecting all installations on the other side of the system to double pressure to earth, earthing an "outer" causes no disturbance whatever to the sound installations on the mains, but installations with small leaks to earth are liable to have their fuses blown, and these faults are thus quickly located by the complaints that are sent in.

Before a consumer could get a shock at excess pressure, a number of factors would have to coincide. It is only rarely that excess pressure exists. Only half the installations will have any portion of the wiring at excess pressure, and they all on the sound side of the system. Only one side of the wiring in these installations will have a higher pressure than normal to earth.

So few consumers get any shocks at all, due to their floors being practical insulators, that the chance of getting a shock off wires at excess pressure is so remote that it is not worth serious consideration.

If faults are developing, it is best to bring them to a head at a time most convenient to the engineer by means which may appear drastic, but which have been operated for years without ill effects, rather than wait for the trouble to overtake one at a time when it might not be so convenient.

Single-phase Alternating Three-wire System.

With single-phase alternating supply, where the three-wire network is fed from static sub-stations, it is best to keep the network in each area isolated by dis-

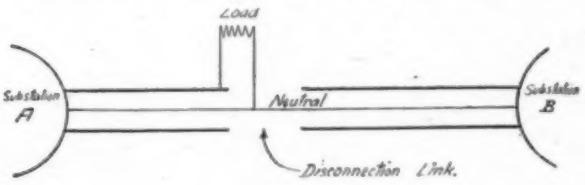


Fig. 4.

connecting links on the live conductors and solidly earth the neutral wire at a sub-station in each area. Any serious fault will automatically disconnect itself through the nearest section fuses, and as single-phase supplies can be arranged in small isolated areas, it is much better to let a fault cut itself out than to nurse it by means of a current-limiting resistance.

While it is desirable to run the network in isolated areas, the disconnecting links of the network are withdrawn only on the live conductors; the neutral should be linked up solid throughout the whole network. A reference to fig. 4 will show the advantage of this arrangement where heavy domestic loads are put on the tail-end of a distributor which has the usual smaller section neutral wire; because the neutrals from two adjacent sub-stations are connected together, a parallel path is provided along the smaller wire.

Where concentric cables are used, a fault on to one of the inner live conductors is almost sure to earth the outer neutral, which gives the effect of a solidly-earthed neutral; this will automatically clear the fault by bringing out the section fuses.

Three-phase Four-wire System.

In three-phase four-wire systems the low-pressure network should be earthed solid as in the single-phase three-wire system, but it is the practice in some under-

takings to connect an adjustable resistance across a circuit breaker in the low-pressure neutral circuit, as in the case of direct-current networks. Under certain conditions the presence of that resistance may cause a variation in the voltage between the different phases and the neutral point and cause lamp failures; that is too big a risk to run merely to be able to limit for a time the current flowing through a fault, though on a large network which cannot be divided up it may be necessary to take that risk.

Plate Aerials for Wireless Reception.

By C. F. MACKNESS, M.I.E.E.

The author, finding it difficult to accept the usual explanation of the manner in which the aerial is supposed to act, and its functions in wireless reception, decided to make some simple experiments which it was hoped would make the principles clearer.

Although there is much more scope for further experiment along the same lines, the experiments made, and the results, proved so illuminating that the author decided to publish the results obtained in the hope that others with more time for research may be sufficiently interested to continue the work.

The current explanation of the function of a wireless receiver aerial is that it receives waves or pulses of alternating current from the ether, these waves causing a current to be generated in the aerial wire. This current passing through the tuning coil causes a difference of potential to be set up between the two ends of the windings of the tuning coil, and this difference of potential causes currents to flow in the detector or rectifier circuit, which reproduce the signals, speech, or telegraphic signals, as the case may be.

It is not apparent how a current can be generated in a wire, one end of which is insulated so that there is no continuous circuit for the current as there is in ordinary electrical circuits.

If one considers the aerial wire as a condenser, however, then the difficulty vanishes, because the current in question would then be the charging current of a condenser which is in a state of constantly varying charge and discharge. Thinking along these lines, the author concluded that a plate insulated from the earth, and placed at a height, should act as an aerial more or less efficiently, and the following experiments appear to confirm this assumption fully.

The receiver set used in the experiments was a simple two-valve set with loose coupling between aerial and h.f. valve, and h.f. transformer coupling to the detector valve.

The location of the receiver set is about 13 miles from London.

An ordinary single-wire aerial of standard length was used for comparison purposes, but was disconnected during the tests.

The first trial was made with a "plate aerial," consisting of a piece of ordinary "meat safe" gauze, with a mesh of about one-sixteenth of an inch, and about a yard square, hung from an insulator on a pole eight feet above the roof of an outhouse, and rather badly screened by the house. A wire was taken direct to the receiver set.

On this plate aerial London could be heard clearly and at good telephone strength, but tuning was critical (very sharp), and the set oscillated easily.

The next experiment was made to try the plate aerial indoors, and in this case a very much smaller plate was used.

A small piece of copper gauze was threaded on a stout wire clamped right into the aerial terminal of the set, the area of the gauze being only 65 square inches. The conditions were very bad, because the plate aerial was only two inches from the wall of the room. Even so, London could be heard distinctly, but not strongly, and tuning was very critical and oscillation difficult to avoid.

In the third trial, a piece of sheet zinc was used, three feet long by one foot wide, mounted on a wooden stiffener, the latter being fitted into a wooden block insulated from the pole and raised 17 feet above the ground. The plate was first tried mounted on end, and happened to be almost "edge on" to London. Again the plate was badly screened, being only three feet from the wall of the house. It was then remounted so that its plane was parallel to the ground, and its long edge parallel to the wall of the house.

In both positions the results were excellent, and quite as good as those obtained with the standard aerial. The same range of other stations can be obtained, and the tuning and stability are at least as good as with the standard aerial.

As an interesting final trial, a crystal set was made up, and on trying this the results were found to be equally good with the plate aerial and the standard aerial.

The surfaces of the standard aerial and the plate aerial are in the ratio of about one to three, but it does not follow that this is the best ratio, and better results still may be obtainable by using a different ratio or arrangement.

As regards the practical application of these results, the author believes that the plate aerial may be a boon to flat dwellers or others who cannot use an outside aerial.

It does not seem to matter much where the plate aerial is placed, and possibly it would function quite well if mounted like a window flower box, or suspended like a barber's sign and coloured so as to be inconspicuous. The first plate used was of iron, the second copper, and third zinc, so that one may conclude that the metal has little influence on the results.

In view of the results obtained indoors with the very small plate aerial, it is probable that a large plate would give good enough results with a valve set to enable the outside aerial to be dispensed with.

Should any of your readers follow up this subject, the writer hopes that they will publish the results for the information of the many who will benefit by them.

Canal Traffic in Sweden.—It is announced from Gothenburg that the Swedish State Waterfalls Administartion has issued a report to the Government, disapproving of the proposal made by Mr. Hj. Cassel as far back as 1917 that electrical working should be employed on the Swedish canals, particularly the Trollehatte canal. The proposal aimed at the application of a system devised by Mr. Cassel for the transmission of power by means of an aerial wire. As a result of the availability of electric power, the administration supported experiments with the Cassel transmission system in the case of agricultural machines, and good results were achieved. In the opinion of the administration it is possible that the system could be employed also for the transmission of energy from a conductor on land to a vessel, but it has not found that suitable conditions exist in Sweden for the electrification of the State canals.

Glass Melted in an Electric Furnace.—According to *Chemical and Metallurgical Engineering*, glass was melted by an electric crucible furnace in the plant of the Feldspar Glass Co., Oshawa, Ont., at the re-commencement of operations after several years' idleness. The furnace is constructed in such a manner that one section of it melts the glass and runs it through a trough to another section, where it is kept molten and in a workable condition.

Anti-Friction Bearings for Electric Motors.

Their Design and Care.

By C. H. S. TUPHOLME.

In the days when anti-friction, or ball and roller, bearings were first fitted to engineering machinery, their feature which made the greatest appeal was their capacity for saving power through the elimination of friction. In those days the bearings were too often incorporated in the design of a machine as an afterthought, and were frequently installed to take the place of a different type of bearing altogether. Happily, both for the designer and the user of such machinery, those days have passed, and it is now being more and more realised that such bearings constitute an integral part of the machine, and their inclusion in the unit is considered at an early stage of the design so that the best results may be achieved. In such cases, particularly in motors and other electrical power equipment, the inclusion of bearings of this type has resulted not

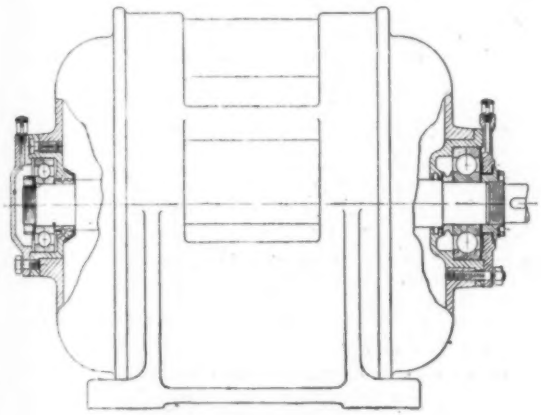


Fig. 1.—A Ball Bearing Motor.

only in increased efficiency, but also in many cases simplified design, lower first cost, and smaller dimensions.

Any engineer who is familiar with ball bearings and the properties of steel balls, appreciates that the capacity of such a bearing is, in general, in proportion to the number of the balls in the bearing and the size of the balls. Thus, it is obvious that the more and the larger the balls that can be got under a given load the larger may that load safely be. It is further to be noted that in nearly every case where bearings have failed, it is the surface of the ball or the race which has given way. A little further study and analysis of the case reveals the fact that the capacity of a ball bearing is in proportion to the amount of surface that is supporting the load; or, in other words, to the amount of surface in contact between balls and raceways that is under load. The strength of a bearing is not limited by the ultimate crushing load of the balls or rollers, but by the elastic limit of the surface of the steel. As soon as this elastic limit is exceeded, the surface begins to break away.

Ball bearings and, of course, roller bearings, have been introduced into electrical machinery chiefly on account of their capacity for reducing friction, thus saving power absorbed in turning a shaft or other rotating part which would otherwise be available for useful work, and also effecting a considerable saving in lubricant. These qualities in a ball or roller bearing are due to the slight friction resistance which characterises such bearings of satisfactory design and construction. In these circumstances the least possible amount of friction in a ball bearing is one of the principal considerations of the designer and builder.

The problem of construction is thus to produce a bearing which not only shows the least possible friction when first installed, but also after long and hard wear.

The designer, in considering his bearing problems, has to take care of bearing loads of various kinds; he has radial loads, thrust loads, and various combinations of both. That is to say, his bearing loads are in many cases liable to come from almost any direction. At one time it was universal practice to support such combination loads on two bearings—a radial bearing and a thrust bearing. Though this principle still obtains with some designers, others have produced a single bearing to carry particular combinations of radial and thrust loads, the principle of design being based on the resultant of the two loads.

The particular problems of electrical machinery have been very carefully studied by designers of ball and roller bearings, and the result is that there are now available anti-friction bearings which will meet the requirements of electrical motive units of every type and operating under all known conditions.

The horizontal motor is an outstanding example of the application of ball bearings to electrical machinery. Fig. 1 shows an application of modern ball bearings to horizontal electric motors, where its introduction has made possible a reduction of from 10 to 20 per cent. in the overall length of the motor, and also permits the use of smaller air gaps than are considered safe with plain journal bearings. Fig. 1 shows the bearing mountings for an enclosed motor. Dirt is excluded from the pulley end by a slinger, which also serves as a locking nut for the inner ring of the bearing, and the possibility of oil leaking into the motor is guarded against by the retainer ring which is pressed on the shaft. Oil is retained in the other bearing by a slinger-

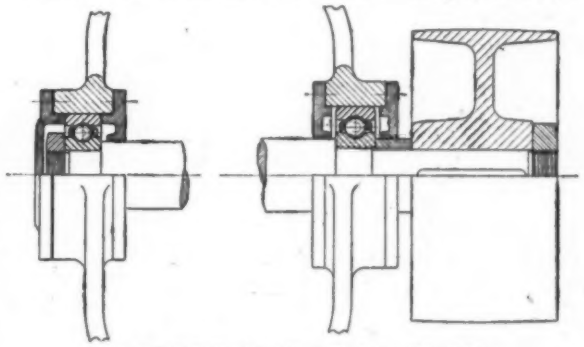


Fig. 2.—Ball Bearing Motor Shaft for Belt Driving.

shaped sleeve. Such a type of seal does not require close adjustment of lateral clearance, and thereby obviates the necessity for great accuracy in machining housings lengthwise.

An application of Hoffmann ball bearings to a horizontal electric motor up to about 10 h.p., with belt drive, is shown in fig. 2. The shaft is carried in two ball journal bearings, the outer race of one bearing being secured endways and serving to locate the armature. For such a purpose it is best to select the bearing at the commutator end of the shaft, since the bearing nearest the pulley has a greater journal load to carry.

The inner races of the bearings should be a tight press fit on the shaft and clamped firmly against the shoulders by means of a nut or its equivalent, the nut being locked in position. The outer races should be a nice push fit on the end plates of the machine. These outer races must not be a slack fit, but at the same time should not be so tight as to prevent the free outer race

aligning itself opposite its inner member. If this is not possible, the probable result is a permanent side thrust on the bearings.

The spigots of the end covers of the housing containing the locating bearing must be long enough to clamp the outer race firmly. The free outer race, which is the one next the pulley, should have ample sideways clearance. In all cases these covers should be spigotted to hold them concentric with the shaft. Where they approach the shaft they should be made as broad as possible and bored to a fine clearance, about 0.01 in. A series of grooves turned in the bore will constitute, when full of grease, a very effective dust seal. End covers are to be preferred even when the end of the

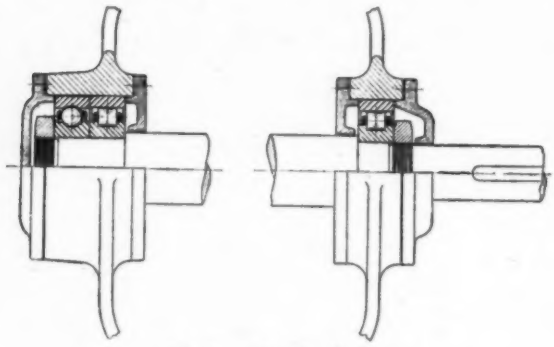


Fig. 3.—A Location Bearing.

shaft is completely enclosed. If the end of the housing is made solid, it is difficult to ensure that the recess for the outer race is parallel for its full width. A Stauffer lubricator can be fitted to each housing as a means of replenishing the grease when required.

For motors of between 10 h.p. and 20 h.p. a roller journal bearing is frequently installed at the pulley end to cope with the extra load.

In the larger sizes of electric motors it is desirable to support the armature on a roller bearing at each end, and it then becomes necessary to provide some independent means of holding the shaft endways. Where the machine is belt-driven, a ball location bearing has been found to be the simplest and cheapest method, and such a design is shown in fig. 3. This location bearing is of the journal type, but is finished

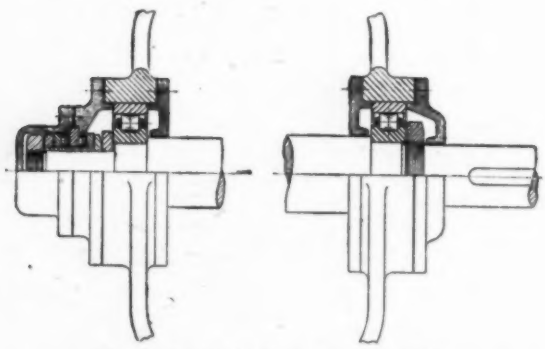


Fig. 4.—Bearing for Large Gear Driving Motor.

below size on its outside diameter, so that when mounted in a standard housing no journal load can come on it, the sole duty of the bearing being to locate the shaft endways.

For medium and large-size electric motors where the drive is by gearing, the most satisfactory arrangement is that shown in fig. 4. The armature is supported on two roller journal bearings. All thrust pressure is carried on a double thrust washer, the design of which is such as to hold the shaft rigidly in both endways directions. Bearings of the type shown in fig. 4, in sizes appropriate to the horse power and speed of the machine, are suited for the heaviest electrical plant.

(To be concluded.)

The Large Water-Tube Boiler.

By P. W. ROBSON, O.B.E., M.Inst.C.E.

(Abstract of a Paper to be discussed on March 24th before the Institution of Civil Engineers.)

The author draws attention to the disparity between the present size of turbine-units and that of boiler units for large powers and contends that the arguments which justify the use of large turbines also extend to boilers. He attributes the use of much larger boiler units in the United States and France than are in use in this country to the fact that the electric power supply in these two countries is provided chiefly by private enterprise. It is unquestionable, however, that during the last few years there has been a new and growing spirit amongst those responsible for electricity undertakings in respect of interest in the boiler plant as being the foundation of the successful working of the station, and the author predicts a four-fold growth in the boiler-power of this country during the next few years.

The author reviews the relation between duty, capacity and efficiency in large boiler units, and contends that in order to construct boilers of large capacity within reasonable overall dimensions, full advantage must be taken of recent improvements in boiler-design whereby it is possible to increase the evaporative duty by 50 per cent. Consideration of the bearing of these improvements, in relation to both boiler and furnace, leads up to the following statement of requirements to be met in the design of large boiler units:—

(1) The design must be suitable for boilers of 100,000-300,000 lb. of steam hourly capacity.

(2) There must be positive immunity from tube troubles and from priming at high duties, and there must be likewise high efficiency.

(3) The design should preferably be best suited for ultimate high working pressures of 500 lb. per sq. in. and upwards.

(4) Boiler and furnace must be suitable for long steaming periods without stoppages from minor causes.

There is ample evidence to show that, if available knowledge and experience are properly utilised, there are no practical difficulties in constructing large boiler-units of the kind referred to. The necessity of proper and ample proportions of furnace is emphasised.

In connection with the use of pulverised fuel the author visualises the possibility that by its means the whole science and practice of steam-raising from coal may be revolutionised. As powdered fuel and air can be closely mixed as they enter the furnace, it becomes possible greatly to reduce the amount of excess air required to guarantee complete combustion, and this renders the system of burning powdered fuel highly efficient. The present encouraging developments have been devised by combustion engineers who have adopted special furnaces to existing types of boilers. The author gives reasons for suggesting much further advance when the co-operation of boiler-constructors is secured to build boilers best suited for the purpose. The addition of pulverising plant to a boiler-house adds to a plant already extensive and complicated. There is no saving in the method of coal storage or in the amount of coal-handling plant required, and the pulversing-plant is a substantial addition thereto. There is no reason why each boiler-house should contain its own pulversing plant. With the establishment of public service pulverising-plants with suitable tank-wagons for the transport of the powdered fuel and with the requisite modifications in fuel storage and fuel-handling arrangements at the boiler houses, the application of powdered fuel assumes a simpler character altogether. The general application of powdered coal for steam-raising is not, therefore, merely a new kind of furnace and stoker. It is a system which, if developed logically, will revolutionise the whole manner of dealing with coal for electric power purposes from the colliery onwards. The final effect, according to this broad plan, will be to facilitate the introduction of large boiler-units and to increase the efficiency of boilers of all sizes and to eliminate the present cumbersome forms of coal- and ash-handling plant. Large boiler-units mean savings in space, cost of buildings, piping and valves, &c.

The author advocates the setting up of a technical committee with the countenance of the Electricity Commissioners, on one hand, and the confidence of those responsible for large power stations, on the other, to review and examine the conception of the large boiler unit.

Illuminating Engineering Departments.—In an article in the *Illuminating Engineer*, Dr. John W. Lieb refers to the co-operation which exists between electrical manufacturers and the central station industry in the United States. In many cases central station companies are, in effect, practical laboratories for the testing of new appliances and for the estimation of their probable commercial success. Many central stations are establishing illuminating engineering departments, and consumers much appreciate the advice of such departments. In some cases such service has even had the effect of reducing consumers' bills owing to the elimination of wasteful appliances and methods. A progressive undertaking, however, is not averse to this, recognising that a satisfied consumer is the best advertisement.

Legal.

Sandford v. Minehead Electric Supply Co., Ltd.

A DIVISIONAL Court composed of Lords Justices Bankes and Scrutton, heard on March 13th an appeal of the Minehead Electric Supply Company against a decision of the County Court judge at Minehead in the action against it by Mr. Sandford, who had been in the employ of the company as secretary and manager. Disputes arose between Mr. Sandford and the company, and he resigned and brought an action against the company for £96 13s. 8d. for special services. The company admitted that £69 12s. 8d. was due and paid that sum into Court. The company contended that Mr. Sandford was not entitled to the items included in the balance. It said that they were things he was bound to do in the ordinary way for the salary he received. Mr. Sandford, on the other hand, contended that they were special services for which he had been promised an honorarium. The County Court judge found for the plaintiff and awarded him £20 in respect of those services.

MR. WILFRED LEWIS, for appellants, contended that under the minute under which Mr. Sandford was appointed he was not to be paid for any special services unless the company thought fit to pay him. There was a discussion as to his resignation and he was given the option of resigning. The letter containing the terms upon which he would resign made no suggestion of remuneration for these services. The real point in the case, Counsel added, was as to the meaning of "honorarium," and he argued that it meant a voluntary payment.

LORD JUSTICE BANKES, giving judgment without calling upon Mr. Crome Johnson, for the respondent, said the appeal raised the question of the construction of the minute. His Lordship thought that the County Court judge was right in his construction of that document. Plaintiff was secretary and manager, and when he applied for an increase of salary he was, in the minute recording this application, described as the engineer and manager. Apparently, said his Lordship, it was recognised that he was doing something outside his original contract, and it was decided to offer him an increase of salary and bonus and to grant an honorarium on the completion of the work in connection with a new generator and also for work in connection with the relaying of cables and whenever he was called upon to perform special duties.

MR. JUSTICE SCRUTTON agreed, and the appeal was dismissed with costs.

Kearsley v. Rothwell.

AT Bolton County Court, on March 12th, George William Kearsley, electrician, Blackburn Road, sued Charles Rothwell, cycle dealer, Blackburn Road, for £69 9s. 3d. for work done and material supplied, also £7 5s. for general electrical work. Plaintiff said he did electrical work at three houses belonging to defendant. The defence was that whatever work Kearsley did was gratuitous, that he was not engaged by defendant, and that from time to time defendant gave him money, totalling about £15, in full satisfaction.

The JUDGE held that plaintiff had performed services for which he was entitled to be paid, and awarded him £22 5s.

Award Against the Douglas (I.O.M.) Corporation.

A NUMBER of property owners in Douglas (I.O.M.), recently claimed damages from the Corporation in respect of injury done and depreciation caused to their premises by reason of the vibration of the Corporation's new generating plant. The arbitrators appointed to investigate the claims have now awarded damages against the Corporation totalling about £30,000, in addition to the costs of the arbitration.

Weber v. Birkett.

THE *Southend Standard* states that it is informed that this action is to be entered for re-trial. The proceedings at the abortive trial were reported in the ELECTRICAL REVIEW of February 6th, and the Lord Chief Justice's decision was recorded in our last issue.

Business Notes.

Bankruptcy Proceedings.—HYMAN WEINER, trading as Harry G. Weiner & Co., 112, Wellington Street, Leicester, wholesale merchant.—The public examination of this debtor was held recently at Leicester. The statement of affairs showed gross liabilities of £11,458, of which £11,431 was expected to rank, against assets of £12,966. Debtor attributed his present position to the failure of a certain firm to make payments to him in accordance with terms. It appeared that up to November, 1923, he lived in London, and traded principally in second-hand machinery. For health reasons he went to Leicester in that year, with £860 capital, comprising certain sewing machines and accessories, and £245 in cash. He commenced business in Highcross Street, Leicester, as a wholesale machine importer and manufacturer of electrical goods. While there he bought and sold principally on a cash basis. In July, 1924, he removed to his present premises and began dealing in wireless goods. In the following October he was appointed agent on a commission basis for the buying of leather belting, cycles and motor-cycle accessories, wireless components, &c., for a certain firm, previously unknown to him and described as sole buying agents for certain foreign chambers of commerce. He thereupon obtained samples of wireless and other goods from manufacturers, the bulk of which he paid for by cheque. In November, December and January last he obtained from these firms on monthly credit terms, goods in bulk which were taken away from the Wellington Street premises in a lorry sent by the firm in question, four times in November, three times in December, and once in January. Debtor stated that his first account against the firm amounted to £5,404 for goods supplied in November, but no payment was made in respect of these, and he continued to supply further goods in December and January. He alleged that they now owed him £10,264. Debtor produced a letter from the firm stating that they did not require any more goods, as those already received were not satisfactory, while they did not intend to pay any money due until they had carefully investigated every consignment. It was stated that debtor had not paid for practically any of the goods which had been supplied to him in bulk. The assets comprised the book debt already mentioned, and the stock in trade valued at £2,650, but it was pointed out that the stock would probably not realise the odd £650. He had obtained large quantities of goods, chiefly in the wireless trade, by means of references issued by persons purporting to have had *bona-fide* business transactions with him, but it was stated that on investigation it had been found that no reliance could be placed on these references. In reply to questions, debtor said that he had been in business in London, and had also been director of a certain firm, while he had carried on a tobacco business in London. On going to Leicester he gave various trade references, but he denied that the firms which he gave as references were "firms of straw." The Official Receiver pointed out that there were hundreds of pounds' worth of goods sold, but no names of purchasers were given in the cash book. Debtor said he had never kept books of account in his life. Questioned as to what had become of the paid cheques and duplicate order books, debtor said they had been left at the office, but the Official Receiver pointed out that they could not be found. In reply to questions, debtor denied that he himself was the firm for whom he alleged he had acted as agent. He said that all the goods he had ordered went to the warehouse of that firm, but he did not know where that was situated. The examination was adjourned.

S. DAVIS & Co. (Harry David Zealander and Sidney Davis), 226, Bishopsgate, E.C., electric lamp dealers.—This firm failed in October, 1924, the receiving order being made on the petition of the British Thomson-Houston Co., Ltd., creditors for £70, costs of injunction proceedings successfully instituted against the firm. The bankrupt Davis applied on March 10th at the London Bankruptcy Court for an order of discharge. The Official Receiver reported that there were no other liabilities and no assets were disclosed. The partner Zealander had recently obtained a discharge subject to a suspension of two years. The Court granted an immediate discharge subject to judgment for £10, to be satisfied by an immediate cash payment.

A. A. CARR and G. S. CHILD (trading as Carr & Child), late of 38, Park Row, Leeds, and at Scarborough, agents for radio products.—At the adjourned first meeting of creditors herein held on March 9th, at the London Bankruptcy Court, accounts were presented showing liabilities of £555 against assets valued at £51. In the absence of any offer the estate was left in the hands of the Official Receiver, to be administered in bankruptcy.

W. E. MELROSE, electrical engineer, Chewton Road, Keynsham, Bristol.—First and final dividend of 3s. 5d. in the £, payable at the Official Receiver's office, 26, Baldwin Street, Bristol.

A. O'DONOGHUE, electrical wireman, 11, Rutland Avenue, Burnley.—Receiving order made March 7th on the debtor's own petition.

H. A. BIRLESON (Birleson & Co.), electrical engineer, Clarence Buildings, Back Fazackerley Street, Chorley.—First meeting March 19th, at the Official Receiver's office, 11, Winckley Square, Preston. Public examination, April 17th, at the Sessions Hall, Preston.

B. E. DIXON (Creswick Dixon Electric Co.), electrical engineer, Bodega Buildings, High Street, 101a, Albert Road, 451, London Road, and 63, Chesterfield Road, Sheffield, and at Electric House, Knifesmith Gate, Chesterfield.—Trustee, Mr. C. Turner, 155, Norfolk Street, Sheffield, appointed March 6th, 1925.

L. L. JAMES (W. G. James & Son), electrical engineer, 62, Canterbury Street, Gillingham, and 137, High Street, Rochester.—Last day for proofs for dividend, March 25th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

C. BINNS (United Electric Co.), electrical engineer, 55, Lowgate, Shipley, Yorks.—Receiving order made March 11th, on debtor's own petition.

J. EAVES, electrical engineer, 102, North Road, Preston.—First meeting, March 25th, at the Official Receiver's offices, 11, Winckley Square, Preston. Public examination, April 17th, at the Session Hall, Preston.

A. MEADOWS, electrician, The Arcade, Penzance.—Last day for proofs for dividend, March 31st. Trustee, Mr. C. Hancock, Official Receiver, 12, Princess Street, Truro.

M. O. HECKELS, electrical wholesaler and agent, 643, Welbeck Road, Walker and Star Buildings, Northumberland Street, Newcastle-on-Tyne.—Supplemental dividend of 11d. in the £, payable March 23rd, at the offices of Messrs. Brittain and Brittain, Pearl Buildings, Northumberland Street, Newcastle-on-Tyne.

Company Liquidations.—NAPIER-KIMBER, LTD., 6, Percy Street, London, W.1., and St. George's Hall, Bradford, wholesale electrical distributors and dealers.—As briefly reported in our last issue, a meeting of the creditors of this company was held on March 9th. The chair was occupied by **Mr. S. H.** Gillett, of Messrs. Dixon, Wilson, Tubbs & Co., C.A., who had been appointed to act as Receiver by the bank, which held debentures, and also as the liquidator in the voluntary liquidation of the company. The statement of affairs presented showed gross liabilities of £23,961, of which £15,000 was expected to rank for dividend. The assets were estimated to realise £11,841, from which had to be deducted £429 for preferential claims, and £8,532 due on debentures. The net assets, therefore, were £2,880, or a deficiency so far as the creditors were concerned of £12,120. The issued capital of the company was £2,161, and as regarded the shareholders there was a deficiency of £14,281. The chairman reported that the company was registered as a private limited liability concern on November 25th, 1913, with an authorised capital of £1,000, of which £752 was issued. Members of the board were Messrs. R. N. Cunningham and A. W. Kimber, who were appointed permanent directors. There had been various changes in the directorate. In January, 1918, the company's issued share capital was increased by 752 ordinary shares of £1 each, which consisted of a dividend of 100 per cent. being re-invested as share capital. In June, 1920, a debenture carrying interest at 8 per cent. was issued to Mr. A. W. Kimber for £4,000 in satisfaction of his claim for commission against the company. In December, 1920, a fresh agreement was entered into between the company and Mr. Kimber, under which that gentleman was to receive a salary of £312 per annum, a commission of 2½ per cent. on all business transacted, and a further commission of 25 per cent. of the net profits. The old agreement provided for Mr. Kimber to receive 5 per cent. on all cash taken. In March, 1921, after returning to the company £1,500 of salary and commission, Mr. Kimber accepted a debenture for £2,500 to secure the amount due to him, and the old debenture for £4,000 was cancelled. Subsequently the nominal capital was increased to £5,000 and the issued capital was brought up to £2,161. In April, 1923, a further mortgage debenture was issued to Mr. Kimber amounting to £4,500, to secure that gentleman's guarantee to the bank. On June 5th, 1923, the debentures in Mr. Kimber's favour amounting to £7,000 were withdrawn, £4,500 being cancelled and £2,500 paid to Mr. Kimber in cash. At the same time a debenture in favour of the bank for £8,900 was created. Mr. Kimber resigned his position as a director on October 24th last, and claimed £3,097 from the company as commission, of which sum £1,000 was paid to him in cash, and he also received a promissory note for £1,000, which was payable on demand, and the balance was to be payable at a future date. During the 15 months to December 31st, 1921, the turnover was £36,638, with a gross profit of £8,643, and a net loss of £24. During the following year the sales were £36,298, with a gross profit of £8,281, and a net profit of £164. In the succeeding year the sales increased to £50,014, with a gross profit of £9,712, and there was a net loss of £36. During the 13 months to February 4th of the present year the sales were only £31,997, with a gross profit of £2,764, and there was a net loss of £13,381. The chairman pointed out that an agreement was entered into last August under which the company gave to Mr. Kimber an indemnity against excess profits duty amounting to £1,798. That matter might require some investigation. He had held a conference of the six largest trade creditors, who had decided that the petition presented for the compulsory liquidation of the company should be opposed. At the same time he was also authorised to accept an offer which had been received for the Bradford branch of the business. Turning to the statement of affairs, the chairman said that there were 262 unsecured trade and expense creditors whose claims actually totalled £14,501. That amount, however, would be increased and he had been informed that there might be a claim for royalties. In addition, there was Mr. Kimber's claim of £1,793, which for the moment had not been included in the liabilities. The chairman said that the stock at Bradford had been sold to Mr. Kimber at cost, less 15 per cent. The largest trade creditors were the Foster Engineering Co., and their representative inspected the stock at Bradford and was satisfied that the transaction was an advantageous one so far as the creditors were concerned. In reply to questions, the chairman said that he did not attempt to get a better offer.

In answer to further questions, the CHAIRMAN said he was certain that the Bradford branch was not making substantial profits, although it had been running since 1917. His own view was that the company was insolvent at the end of 1923, as the balance sheet then prepared did not provide for the E.P.D. liability, but only mentioned it in a footnote.

Mr. HOUSTOUN pointed out that after Mr. Kimber left the company a new banking account was opened, and apparently the effect was to reduce Mr. Kimber's liability under his guarantee to the bank, if any existed. Mr. JOSEPH, a creditor, said he could not understand why the company should have done this to the detriment of the other creditors.

Mr. HOUSTOUN remarked that it was a one-man company, and the effect of various transactions was that Mr. Kimber was entering into agreements with himself. He thought it was a case for compulsory liquidation.

Eventually a resolution in favour of the voluntary liquidation being continued was defeated on a show of hands, and Mr. Houstoun stated that a petition for the compulsory liquidation of the company would be proceeded with.

The following are creditors:—

	£		£
Accumulators Co.	63	F. W. Lowenadler, Ltd.	37
British Thomson-Houston Co., Ltd.	26	London Battery & Cable Co.	65
F. C. Blackwell & Co., Ltd.	116	Matthews Bros., Ltd.	27
Bradford Corporation	37	Mines & West	163
Benjamin Electric, Ltd.	22	Mortimer & Co.	25
Baxter & Simpson	60	Metropolitan-Vickers Electrical Co., Ltd.	315
J. B. Bruce, Ltd.	24	Macintosh Cable Co., Ltd.	53
Berry's Electric Co., Ltd.	56	E. Mitchell	47
Brook Bros. & Dean, Ltd.	67	Nogi & Co.	34
— Burleigh	63	Northern Cable & Wire Works	257
J. Barkers, Ltd.	36	Padruth, Ltd.	117
Cable Accessories Co., Ltd.	601	J. Pitcher & Co., Ltd.	55
Callender's Cable & Construction Co., Ltd.	485	T. Price & Sons	21
J. A. Crabtree & Co., Ltd.	65	C. Pratt & Sons	21
H. Clarke & Co.	163	Perfecta Seamless Steel Tube and Conduit Co., Ltd.	146
— Castellina	60	H. G. Richardson & Sons	23
Credenda Conduits Co., Ltd.	146	A. E. & W. Rose	63
G. W. Dray & Son, Ltd.	20	J. Russ & Co.	25
Edison & Swan Electric Co., Ltd.	29	Reeves & Co.	37
Electric Suction Cleaner Co.	24	Richson & Co.	28
Enfield Cable Works, Ltd.	20	Soupham & Wood	47
Foster Engineering Co., Ltd.	2 060	Stella Conduits Co., Ltd.	110
Farringdon Box Works	23	J. H. Stewart & Co.	170
Fuller's United Electric Works, Ltd.	45	Siemens & English Electric Lamp Co., Ltd.	115
Geipel & Co.	132	Sturge & Baker	91
A. L. T. Gremigne	136	Siemens Bros. & Co., Ltd.	63
Gent Bros.	23	D. Shanks & Co., Ltd.	127
General Electric Co., Ltd.	29	Sun Electrical Co., Ltd.	30
Hotpoint Electric Appliance Co., Ltd.	56	T. Smith & Son	28
Holophane, Ltd.	23	Service Radio Co.	26
L. Hewitt	47	Sterling Accessories, Ltd.	58
J. Hall & Co.	73	Superlite Co.	24
Hayes, Candy & Co., Ltd.	115	Trevelyans (Birmingham), Ltd.	23
Harding & Ehriman	297	W. R. Thornton & Sons, Ltd.	126
Johnson & Phillips, Ltd.	57	Vincent Switchgear Manufacturing Co.	29
A. & C. Joseph	59	Vigers, Sons & Co., Ltd.	23
Jackson Electric Stove Co., Ltd.	36	Wholesale Fittings Co.	69
L. Jacobs	31	Western Electric Co., Ltd.	94
H. F. Kemp & Co., Ltd.	30	West London Timber Co.	21
London Electric Wire Co.	37	J. C. White	39
L.M. & S. Railway	29	Wandsworth Electric Manufacturing Co.	25
Liverpool Electric Cable Co., Ltd.	41	Woodfyt Manufacturing Co.	82
— Lechtholz	68	W. C. Yuille	436

GEORGE ENGLAND (1922), LTD., Walton-on-Thames, dealers in batteries, &c.—A meeting of creditors was held recently, when the chair was occupied by Mr. C. Latham, who had been appointed to act as the liquidator in the voluntary liquidation of the company. Mr. Latham stated that according to the books the assets totalled £5,667, and they were estimated to realise £3,413. From the latter figure had to be deducted £33 for preferential claims, leaving free assets of £3,380. That amount was insufficient to meet the claims of the debenture holder, which totalled £4,133. There was a deficiency as regarded the debenture holder of £752, while the other liabilities were:—Unsecured trade creditors, £3,044; bank loan, £1,500; and bank overdraft, £1,089. In addition there were contingent claims to the extent of rather more than £700 which for the moment had not been admitted. The deficiency as regarded the creditors was £6,405. Mr. Latham stated that the company was formed in May, 1922, with a nominal capital of £10,000. The issued capital was £6,100. The company acquired the business previously carried on by George England, Ltd., which was in liquidation, whilst a receiver had been appointed. The present company paid £3,300 to the receiver for the business, but did not take over any of the old liabilities. In October, 1922, debentures for £4,000 were created, and were subsequently all issued for cash. Apparently the company had been carried on at a loss since its inception, and the losses exceeded £10,500.

It was decided to confirm the voluntary liquidation of the company with Mr. Latham as liquidator. An advisory committee was also appointed, consisting of Mr. W. Baker, the Chloride Electrical Storage Co., Ltd., and Iliffe & Sons. Among the creditors are the Chloride Electrical Storage Co., Ltd. (£681); the Arbour Electric Supply Co., Ltd. (£36); and Auto-Bulbs, Ltd. (£25).

B. BARNETT (ELECTRICAL ENGINEERS, LEYTON), LTD.—A petition for the winding up of this company has been presented to the High Court by the Davis Electrical Co., Ltd., of 6, Warwick Court, High Holborn, W.C., and the Electrical Supplies Co., Ltd., of 233, Tottenham Court Road, W.C., creditors, and will be heard in London on March 24th.

BRITISH RADIOPHONE, LTD.—Winding up voluntarily. Liquidator, Mr. R. C. Sheen, Capel House, 62, New Broad Street, E.C. Meeting of creditors, March 30th, at Capel House. This notice is purely formal; all creditors of the company have been or will be paid in full. Particulars of claims to be sent to the liquidator by March 26th.

SPRINGFIELD ELECTRICAL MOTORS, LTD., Leeds.—First dividend of one shilling in the £. Mr. V. Walton, liquidator, 26 and 27, Bond Street, Leeds.

FALLON CONDENSER MANUFACTURING CO., LTD.—Winding up voluntarily. Liquidator, Mr. S. Allen, 174, Northumberland Park, N.17.

RADIOLECTRIC, LTD.—A meeting of creditors is called for March 24th, at the offices of Messrs. Reeve, Parker & Co., 2, Coleman Street, E.C.

RICHSON & CO., LTD., electrical suppliers, 113, Oxford Street, W.—A meeting of the creditors of the above was held on March 9th at the offices of Messrs. Francis, Nicholls, White and Co., when Mr. G. White stated that he had been appointed to act as the liquidator in the voluntary liquidation of the company. The whole of the liabilities had been, or would be paid in full.

Dissolutions of Partnership.—RICKETTS & DAUNCEY, wireless component manufacturers, 34, Windmill Street, Birmingham.—Mr. J. E. D. Dauncey and Mr. A. E. C. Ricketts have dissolved partnership.

ADASTRAL WIRELESS MANUFACTURING CO., wireless apparatus manufacturers, 2, Sycamore Street, Sheffield.—Messrs. S. Gardner, J. Melling, L. A. Whitaker, J. W. Boddy, H. J. Ping, C. Hartley, W. A. C. Cooke, J. H. Stevenson, L. A. Gamblen, and E. Hainsworth, have dissolved partnership.

Private Arrangements.—STANDARD ACCESSORIES CO., LTD., 56, High Street, Bloomsbury, W.C.—A meeting of creditors was held on March 5th at the offices of the solicitors of the company. No detailed statement of affairs was presented, but it was reported that the liabilities were approximately £1,950, whilst the assets consisted of stock, fixtures and fittings, valued at £490. The company was registered on October 4th, 1924, with a nominal capital of £500, of which £400 had been issued for cash. The present deficiency was due to the selling of goods at cost or a little over in order to get the company established. An offer was made to the creditors of 3s. 6d. in the £, payable within one month, but after some discussion the offer was amended to one of 5s. in the £, payable within four weeks, and suitably guaranteed. It was decided to accept this offer, subject to the satisfaction of a committee of the principal creditors. The committee consisted of the representatives of Fellows Magneto Co., and Arthurs Wireless Co., and Mr. C. Latham.

WALKER'S WIRELESS SUPPLY CO., 31, Westgate Road, Newcastle-on-Tyne.—A meeting of creditors was held recently at Newcastle-on-Tyne, when Mr. Forster, of Messrs. Keenlyside and Forster, representing cash creditors whose claims amounted to £1,800, occupied the chair. It was reported that the largest trade creditor had commenced proceedings, and the company was forced, in the interests of the general body of creditors, to call a meeting and discuss the position and decide the best course to adopt. The company was formed and commenced business at Newcastle in May, 1922, with £150 borrowed capital. Branches were subsequently opened at Edinburgh, Dundee, and Aberdeen. The accountant said that owing to very short notice no proper statement of affairs could be presented. According to a trading account for the six months ended February 28th, 1925, there was a net profit on all the branches amounting to £1,324. The present position was attributed to lack of capital. It was decided that a deed of assignment should be executed in favour of Messrs. Corfield & Cripwell, of Birmingham, and Mr. H. J. Armstrong, of Newcastle, as joint trustees, to protect the estate. A committee of inspection was also nominated, and it was given power to carry on the business as a whole or dispose of the whole or part. The committee of inspection consisted of the representatives of the General Electric Co., Ltd., the Metropolitan-Vickers Electrical Co., Ltd., *Newcastle Chronicle*, Ltd., the Edison Swan Electric Co., Ltd., and Mr. Kelvey, of Messrs. Coss & Sinclair.

The following are creditors:—

	£		£
General Electric Co., Ltd. ...	1,960	Moore, J. W.	20
Metropolitan-Vickers Electrical Co., Ltd.	183	Courtinay, J. W.	21
Edison Swan Electric Co., Ltd.	91	MacPherson, J.	32
India-Rubber Co., Ltd.	84	*Edinburgh Evening Dispatch* ...	42
Marconiphone Co., Ltd.	66	Kremnin, L.	21
Western Electric Co., Ltd. ...	40	Edinburgh Corporation	56
Lowenadler, S. W.	40	Brown, S. G., Ltd.	34
Tele-Radio, Ltd.	84	*Newcastle Chronicle*	27
Ripaults	60	Aberdeen Electric Supply Co....	29
Heron, G. W.	35	Abrahams, J.	60
Radio Instruments, Ltd. ...	58	Cossor Valve Co., Ltd.	27
Marshall, P.	46	Mason, G. H.	64
Hadden, F.	21	Man S. D. H. Co., Ltd. ...	91
Paragon Rubber Co., Ltd. ...	197	Rotherthel, Ltd.	38
National Cash Register	168	Boyd, F. M.	44
London Electric Wire Co. ...	118	Radi-Arc Electric Co.	35
Berci, M.	197	*Newcastle Chronicle*	1,699
Garston Sinclair Co., Ltd. ...	51	Marconiphone Co., Ltd.	20
Spicois, Ltd.	125	Garston Sinclair Co., Ltd. ...	45
Ansell, Jones & Co., Ltd. ...	34	Miller, R. F., & Co., Ltd. ...	82

Trade Announcements. — MESSRS. SUTCLIFFE BROS. AND BRYCE, LTD., of Hyde, have appointed Mr. L. C. Brocks as one of their London representatives.

MESSRS. FULLER'S UNITED ELECTRIC WORKS, LTD., have removed their London depôt from 58, High Street, W.C.2, to 176, Tottenham Court Road, W.1, where large stocks of their cable, accumulator, dry battery and radio manufactures will be available. 'Phone: "Museum 9008-9009." Teleg. address: "Fullasparta," London. The company's Leeds agent, Mr. F. Dawson, has taken larger premises at 7, Park Square, Leeds, where he will carry stocks.

In order to avoid further confusion, Mr. G. F. A. Stone, proprietor of the LIGHTING SUPPLIES COMPANY, 4 and 5, Finsbury Avenue, E.C.2, manufacturers of "Finstone" wireless products and doing wholesale trade only, asks us to state that he is not connected with another firm doing a retail trade in multiple shops under a similar style and having a proprietor of the same name.

Messrs. Ebonestos Insulators, Ltd., have appointed Mr. A. D. MYERS (late of Reyrolle & Co.), 10, Belmont Avenue, Harrogate, sole agent for their insulating products for Yorkshire, Durham, and the Newcastle district of Northumberland. Mr. MALCOLM BREINGAN, 57, Robertson Street, Glasgow, has been appointed sole agent for Scotland.

Mr. W. BRIDGE has been appointed sole agent for England and Wales for the Ideal Commutator Dresser Co., of Sycamore, Ill., U.S.A. A number of leaflets relating to their "Ideal" commutator resurfacers, which are used by a large number of American electrical and other companies, have been received.

MESSRS. ROBERTS & Co. have opened business in Old Town Street, Plymouth, as electrical engineers.

Catalogues and Lists.—THE JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.—A blotter bearing a calendar for March and an illustration of the company's domestic wash boiler.

THE WESTERN ELECTRIC CO., LTD., Connaught House, Aldwych, W.C.2.—An illustrated and priced pamphlet advertising the company's radio apparatus, including loud speakers, receiving sets, telephones, batteries, &c.

THE M.A.P. COMPANY, Great Lister Street, Birmingham.—A list of the firm's products, which include sparking plugs, motor accessories, radio apparatus, &c.

MESSRS. A. J. STEVENS & CO. (1914), LTD., Walsall Street, Wolverhampton.—A well-illustrated catalogue of radio apparatus, including receiving sets, condensers, coil-holders, valves, &c.

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2.—A folder containing illustrations and prices of "Mazda" flash-lamp bulbs.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—March stock list of motors and dynamos.

MESSRS. J. A. CRABTREE & CO., LTD., Lincoln Works, Walsall.—A pamphlet containing prices and coloured illustrations of the company's tumbler switches, with special covers. Priced.

AUTOVEYORS, LTD., 82-84, Victoria Street, S.W.1.—A trade price list of "Clix" plugs, sockets, &c.

MESSRS. OERLIKON, LTD., 34, Norfolk Street, London.—Bulletin No. 43, dealing with cranes and locomotives, and Bulletin No. 44, giving an account of three double induction regulators installed in a Manchester sub-station, and an article on single-phase induction regulators.

THE BRITISH THOMSON-HOUSTON CO., LTD., Mazda House, Newman Street, Oxford Street, W.1.—An illustrated and priced booklet dealing with the "Tungar" rectifier for battery charging.

FULLER'S UNITED ELECTRIC WORKS, LTD., Woodland Works, Chadwell Heath, Essex.—List 315 C., containing details and illustrations of the company's radio-telephone products, including batteries, loud speakers, transformers, coils, &c.

MESSRS. A. B. CLEWORTH & CO., LTD., 118, Queen Victoria Street, E.C.4.—Illustrated booklets describing the "A.B.C." air filter for machinery and ventilation.

MESSRS. SIEMENS BROS. & CO., LTD., Woolwich, S.E.18.—Two coloured "transparencies" for affixing to shop windows advertising, respectively, "Siemens" loud speakers and head telephones.

KENT BROS. ELECTRIC WIRE CO. & E. H. PHILLIPS, LTD., 15, Berners Street, Oxford Street, W.1.—Pamphlets dealing with cotton, silk and enamel covered, tinned-copper and bare resistance wires, &c., together with a list of B.E.S.A. standards for annealed copper wires.

MESSRS. HERBERT MORRIS, LTD., Loughborough.—Book 84, illustrating the company's pulley blocks and trolleys of various kinds.

MESSRS. CONNOLLYS (BLACKLEY), LTD., Blackley, Manchester.—Two pamphlets advertising "Blackley" adhesive insulating tape.

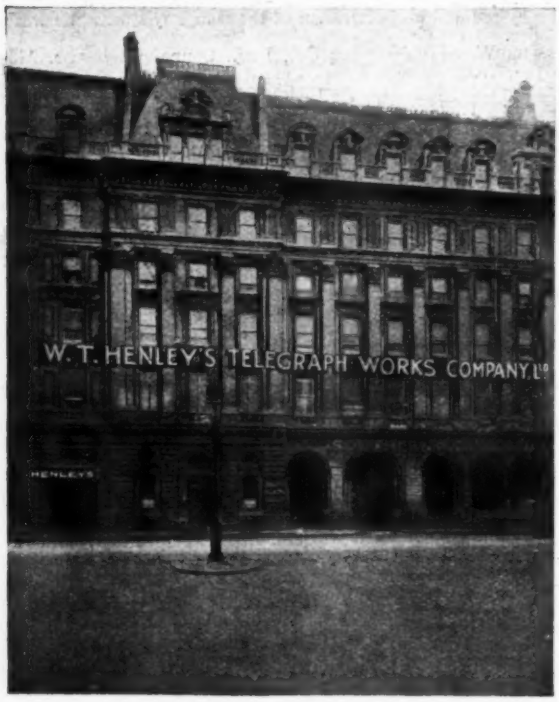
MESSRS. TAYLOR & PARSONS, LTD., Bond Street and Aldermanbury, Bradford.—A pocket price list of electrical wiring materials and accessories.

French Bauxite Exports.—A deputation representing the syndicate for the defence of the owners of the deposits of bauxite in the Var and of representatives of the companies working the deposits, was received by the French Minister of Commerce recently in order to place before him their views as to the danger incidental to the adoption of a proposed scheme for restricting or suspending the exports of bauxite. In reply to the representations made, the Minister is reported to have stated that the investigations carried out only concerned a general inventory of the national resources and of the elements of the export trade. He added that no decision would be arrived at without the Parliamentary representatives of the Var being previously given an opportunity of presenting a defence of the interests entrusted to them.

German Competition in India.—Under this heading in our issue of January 30th, p. 176, we quoted a correspondent to the effect that the India Stores Dept. bought regardless of quality the cheapest that it could get. We understand that this statement has given a wrong impression. The Department, while it certainly buys cheaply, does not do so "regardless of quality." The cheapness, we are informed, is the fault of the severe competition to secure the Department's orders, but quality is certainly studied, and the Departmental inspectors will pass nothing which is not first class of its kind.

Patent Application. — Application has been made for the restoration of patent No. 142,719, of 1919, granted to H. C. Sanders for "Improvements in Electrical Apparatus for Heating Liquids."

Henley's Move to Holborn.—On Wednesday, March 18th, Messrs. W. T. Henley's Telegraph Works Company, Ltd., forsook the old premises in Blomfield Street, London Wall, E.C.2, which have been so familiar to the trade for the past 21 years as their headquarters, and they have now taken up their abode in the imposing building in Holborn Viaduct, which was formerly the Viaduct Hotel. The London warehouse of the company has been situated for some years at 12, New Union Street, E.C., but this, too, has been transferred to the new head office, the postal address of which is 11, Holborn Viaduct, London, E.C.1. The reasons which influenced the board in making the change were several. First, the lease at Blomfield Street expires on March 25th. Then the continually increasing staff as the company proceeded on its progressive way, called for more and more accommodation, until the premises there were quite inadequate to the needs and a large part of the staff has been occupying other offices in New Broad Street and in Finsbury Circus House. This scattering abroad now gives place to a concentration of all departments under one roof in the new premises, the advantages of which should be very substantial. The interior of the old hotel has been re-arranged internally and decorated under the supervision of Sir Henry Tanner, the architect, to make a commodious suite of modern offices and warehouse.



Messrs. Henley's New Premises.

E.D.A. Kinema Films.—Among the many activities of the E.D.A. has been the preparation of kinema films for exhibition to the public, and these, as already stated, are at present being exhibited in some of the Northern towns. On Friday, April 17th, at 7.30 p.m., however, they are to be shown in the Kinema Hall at Australia House, Strand, London, W.C.2, and all interested in the electrical industry are cordially invited to attend. A number of cards of invitation are to be distributed, but there will be ample accommodation for those whom these cards may not reach.

Italian Enterprise in Switzerland. — It is reported from Bodio, in the Canton of Ticino, that an Italian company is negotiating for the establishment of an electrochemical factory in that district, where ample supplies of electric power are available.

Patents and Trade Marks in Japan.—The period for reinstating patent and trade-mark rights in Japan, the evidence of which had been lost through destruction of the Japanese Patent Office records in the earthquake, has been further extended to April 30th.

Trade Marks in Chile.—According to a decree issued by the Department of Industrial Property, a newly-instituted Government Department, any distinction hitherto drawn between commercial and factory marks is to be abolished, and one mark only, known as "commercial," will henceforth be permitted. The Department has decided to establish an office for the registration of trade marks. For trade marks registered for more than one class of goods a separate registration fee must be paid; but when more than two classes are registered by the same applicant a 50 per cent. discount will be allowed. A new list of patent and trade-mark fees has been drawn up, these being considerably in excess of the old.—*Reuter's Trade Service* (Santiago).

New Municipal Showrooms.—The Sheffield Corporation Electricity Supply Committee recently proposed to obtain the lease of premises in the High Street for a period of 21 years for the purpose of an electrical showroom, and alterations were to be made for this purpose at a cost of £2,200. The Town Council, however, rejected the proposal.

The Paisley Town Council is to lease premises in Gilmour Street as an electrical showroom.

British Trade-mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 4th, 1925. In the case of foreign applications, the name and address of the British representatives are also given :—

Saba. No. 454,537. Class 8. Radio telephonic headphones and transformers.—Schwarzwalder Apparate-Bau-Anstalt August Schwer Sohne, Villingen, Baden, Germany. (Lawrence M. Davies, Mitre Chambers, Mitre Street, E.C.3).

Supaul. No. 454,896. All goods in Class 8.—Superlamp, Ltd.

Design of Witch and Broomstick. No. 455,605. Class 8. Instruments and apparatus for use in radio telephony.—Jose Marcel Ortega, Garratt Lane, Earlsfield, S.W.18.

Becop. No. 455,775. Class 8. Instruments and apparatus for use in radio telegraphy and telephony.—William Jas. Palmer, trading as the British Electrical Manufacturing Co., 27a, Bangalore Street, Putney, S.W.15.

Uviator. No. 455,635. Class 11. Instruments and apparatus for use in light therapy.—Kelvin, Bottomley & Baird, Ltd.

Stoco. No. 455,570. Class 13. Lighting fittings.—J. Stone & Co., Ltd.

Fly. No. 454,124. Class 18. Electric fires and radiators.—Berry's Electric, Ltd.

Yesly. No. 455,108. Class 50. Insulating substances (electrical) of asbestos, mica, oils or bitumen, &c.—Engineering Supplies, Ltd.

The date for the following is March 11th :—

Maud. No. 454,634. Class 6. Magnetos, &c., all being parts of machinery for motor cars.—The Maudslay Motor Co., Ltd., Coventry.

Central Electric Development Co., Ltd. (lettering and design). No. 454,818. Class 6. Machinery of all kinds and parts.—Central Electric Development Co., Ltd., Newport, Mon.

Multidyne. No. 454,778. Class 8. Instruments and apparatus for use in radio telephony and telegraphy.—British Radio Valve Service, Ltd., Hazlitt House, Southampton Buildings, W.C.1.

Mow. No. 455,031. Class 8. Thermionic valves, electric discharge tubes, and other similar vacuum tubes.—The M.O. Valve Co., Ltd.

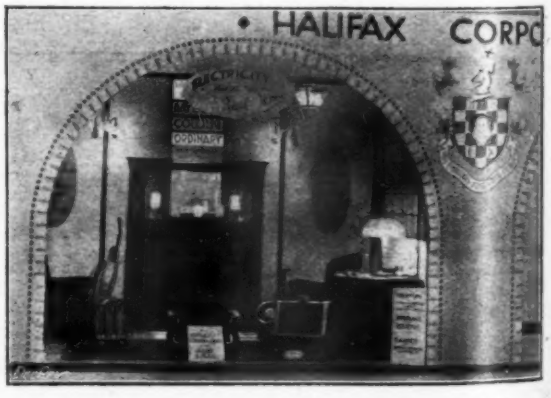
Gordo, No. 455,183, and Daintless, No. 455,221. Class 8. Apparatus for use in radio telegraphy and telephony.—H. Gordon (London), Ltd., 8, City Road, E.C.1.

Cymatron. No. 455,549. Class 8. Instruments and apparatus for use in radio telephony and telegraphy.—Norman Hall, trading as the North-Eastern Instrument Co., Gateshead.

Busco. No. 452,970. Class 13. Stamped and pressed metal goods for use in connection with electrical apparatus.—Busby & Co., Ltd., 43-47, Price Street, Birmingham.

Rubbolite. No. 454,817. Class 13. Electric lamps (ordinary) encased in india-rubber.—Flexible Lamps, Ltd., 102, Wigmore Street, W.

Exhibitions at Halifax.—Two exhibitions giving opportunities for the display of electrical apparatus have been held in Halifax during the past few months, and on each occasion the Corporation electricity department has been represented. A stand which the department arranged at a Trades Exhibition was in three parts, an inquiry bureau, a wash-house, and a kitchen. A facia above indicated the keynote of the exhibit "Cleanliness." In the kitchen "Tricity" cookers were demonstrated, and in the wash-house "Alco" and "A.B.C." washing machines were shown in operation.



The Halifax Corporation Electrical Display at a Local Exhibition.

A later exhibition (Ideal Homes) proved better from the business point of view, the department receiving orders for a very large number of cookers, as the result of a well-arranged display of all kinds of electrical appliances. The appliances were shown in a two-compartment stand representing a lounge and a kitchen. The lounge is illustrated in the accompanying figure.

Unemployment.—There was an increase of 1,638 in the total number of unemployed during the week ending March 2nd, the figure at that date being 1,237,760.

Locomotive Works Reconstruction.—The London, Midland and Scottish Railway Co. has decided to carry out an elaborate scheme of alteration and building at its Crewe locomotive works. At present the works can produce 70 new locomotives a year and deal with 1,200 heavy repair jobs; the reconstruction will increase this capacity by 50 per cent. Among the improvements which will be introduced are high-speed electric cranes for the erecting shops. The estimated expenditure upon the works is £500,000.

New Spanish Company.—La Sociedad Impulsadors de Negocios Electricos is the name of a new company which has lately been formed in Barcelona to establish electricity undertakings in Spain.

The Cuban Electrical Market.—An American commercial representative at Havana says that increased sales of electrical goods are reported from some sources in Cuba. Increased building activity has resulted in a large increase in the consumption of electrical wiring materials. The improvement of the electricity supply has increased the demand for appliances of all kinds. Electricity is being used to a greater extent in sugar mills, and interest in radio is very intense.

Indian Electrical Imports.—The Trade Commissioner at Calcutta (Mr. D. M. Clarke) has prepared for the Department of Overseas Trade a report upon the imports into India during the nine months ended December 31st, 1924. From this it is seen that the value of electrical machinery imported during this period was Rs. 138.5 lacs, as compared with Rs. 162 lacs in the equivalent period of 1923. The largest share of this trade, Rs. 94.5 lacs, fell to the United Kingdom, although this share was Rs. 34 lacs below the total in the equivalent period of 1923. Imports from Germany increased from Rs. 11.5 lacs to 16 lacs, while those from the United States decreased from Rs. 14 to 12 lacs. The increase in the German trade was principally in the direction of electrical wires and cables, meters, telegraph and telephone apparatus, cheap fittings and accessories. The largest exporter of electric lamps was Holland, the United Kingdom was second, and Germany third.

Chinese Electrical Imports.—According to statistics published by *Commerce Reports*, the total value of electrical imports during 1923 was about £1,300,000, as compared with £1,560,000 in 1922. Germany was the principal supplier, having contributed about £330,000, as compared with £165,000 in 1922. Great Britain's share decreased from £470,000 to less than £200,000; that of the United States from £280,000 to £211,000; and that of Japan from £460,000 to £400,000.

Lectures on Lighting.—On March 25th and 26th, at Newcastle, Mr. W. E. Bush, manager of the E.L.M.A. Lighting Service Bureau, is to deliver lectures on correct illumination. The first will be directed to shopkeepers, being entitled "Light as a Sales Force," and indicating the advantages to be obtained from efficient shop-window illumination and "after-hours" lighting. The other lecture is for representatives of the electrical and allied industries and, under the title "Modern Electric Lighting," will cover a wider field, dealing with lighting generally and numerous special applications.

The Rating of Machinery.—The recommendations of the Inter-Departmental Committee upon the Rating of Machinery and Plant were reviewed in our last issue (p. 431). We have now received from the Machinery Users' Association (Inc.) a communication in which it is urged that loose, portable, or "tenant's" machinery, being personal property, should not be assessed to local rates at all. The draft of a Bill which the Association proposes to promote is enclosed; this provides for the exemption from local rates of portable or travelling machinery and plant. Lifts and elevators, tramways, &c., are not exempted in the Bill.

In the House of Commons on March 12th, Mr. Neville Chamberlain (Minister of Health) said that it was hoped to introduce legislation dealing with the matter during the present session.

South African Radio Business.—The annual Industrial and Financial Supplement to the Johannesburg *Star* (which may be obtained from the London offices of that newspaper at 82-85, Fleet Street, E.C.4.), contains an interesting article on the rapid growth of the business in radio-receiving sets and components. It is stated that the opening of the Johannesburg broadcasting station last year resulted in a run upon the available apparatus which rapidly depleted the stocks. The dealers were totally unprepared for the "boom" and much business was lost in consequence. The interest has only slightly abated but whereas the original demands were for complete receiving equipments, the public has now learned something of construction and is, to a large extent, building up its own sets. The urban business, which is now characterised by fine discrimination and largely confined to components, suggests a continuance of steady business in lines of British and American goods of reputation. The rural business has scarcely been touched, although the Dominion is fairly well served by the stations at Johannesburg, Capetown and Durban, with a fourth in prospect.

Electricity for Mexican Town.—*Commerce Reports* states that the town of Comayaguela, Mexico, with a population of between eight and ten thousand, is desirous of obtaining water and electricity supplies.

Fire.—On March 13th the premises of Mr. D. Rowan, electrical and mechanical engineer, Leather Lane, Liverpool, suffered serious damage by fire. The two upper floors of the building were affected; the premises contained rubber goods and radio accessories.

Social Events.—The Elliott Social Association (Messrs. Elliott Bros. (London) Ltd.), held its annual social and concert on March 7th. Between 600 and 700 were present, including several directors of the company. The first half of the programme was provided by Mrs. C. T. F. Osman, Mrs. R. Smith, Miss Dorothy Ainsworth, Miss D. Mackay Webster, Mr. Leslie Wissler, and the Century Works Orchestra under Mr. R. O. Smith. The second part was given by the "Queer Cards" concert party. Dancing was also arranged for in another hall, the music being provided by Mr. Tom Gray's "Excelsior" band.

The annual dinner of the staff of the Willesden District Council Electricity Department was held in the Club Room, Salusbury Road, on the 7th inst. The chairman (Mr. A. W. Blake, the electrical engineer) was supported by the chairman of the Council and members of the Electricity Committee. Mr. Blake, in proposing the toast of the "Electricity Committee," referred to the very rapid progress which the Department had made compared with most undertakings which were comparable in size with that of Willesden 10 years ago.

The Department had had a particularly strenuous year. September saw the completion of the conversion of the whole of the street lighting from gas to electricity, over 2,700 lamps being involved; they had added four additional sub-stations, and had changed 1,300 consumers over from direct to alternating current. All this and other work had been carried out by direct labour and without any addition to the technical or supervisory staff. Considerable extensions were in hand for the ensuing year, including six additional static sub-stations and a new direct-current sub-station which, after due consideration of static converter plant, it had been decided to equip with rotary converters. The musical programme was provided by members of the Department.

The Automatic Telephone Manufacturing Co., Ltd., held its second annual staff dinner at the Exchange Hotel on March 6th. The chair was occupied by Mr. G. W. Moore, manager, whilst the chairman of the company, Sir Alexander Roger, and three other directors, Mr. Dane Sinclair, Mr. Jas. Taylor, and Mr. Eric Taylor, were also present. Covers were laid for 130, and an excellent musical programme was provided under the direction of Mr. Wilfred Bird, L.R.A.M. There was a brief toast list, in which appropriate references were made to the activities of this leading Liverpool industry. The company's works at Edge Lane is now occupied with the manufacture of automatic telephone equipment for Greater London, Tokio, Sydney, and other large centres of population.

Local Exhibitions.—DOUGLAS (I. OF M.).—A Cookery Exhibition which was recently held was very successful, and orders for a number of electric cookers were booked.

GOSFORTH.—Messrs. H. Chapman & Co., in conjunction with the Newcastle Electric Supply Co., are holding an All-Electric Home Exhibition in a newly-erected villa in the district.

Book Notices.—"Wireless Valve Receivers and Circuits in Principle and Practice," by R. D. Bangay and N. Ashbridge; pp. viii + 128; 72 figs. Price 2s. 6d. net. "The Home Constructor's Easy-to-Build Wireless Sets," by F. H. Haynes. Pp. 63; figs. 47. Price 1s. 6d. net. "Tuning Coils and Methods of Tuning," by W. James. Pp. viii + 128; 72 figs. Price 2s. 6d. net. London: The Wireless World (Iliffe and Sons, Ltd.).

"The Production and Measurement of Low Pressures," by F. H. Newman. Pp. 14 + 192; figs. 48. London: Ernest Benn, Ltd. Price 16s. net.

"The Design of Marine Diesel Engines," by A. Buchanan. Pp. 79; figs. 35. London: The Technical Section, Association of Engineering and Shipbuilding Draughtsmen. Price 2s. net.

"The *Transactions* of the South African Institution of Electrical Engineers, December, 1924-January, 1925." Johannesburg: The Institute. Price 2s.—The principal features of this issue are some "Notes on Wembley Exhibition and World Power Conference," by the retiring president (Mr. Bernard Sankey), and a report of the annual meeting of the Institute. At this meeting Mr. H. W. Clayden was inducted into the presidential chair and Dr. H. J. Van der Bijl was elected vice-president. A report of the annual dinner and Mr. Sankey's valedictory address are also included.

"Circuit Troubles and Testing," by T. Croft. Pp. x+224; figs. 237. Price 12s. 6d. "Connecting Induction Motors," by A. M. Dudley. Pp. xiii+361; figs. 289. Price 15s. "Magnets," by C. R. Underhill. Pp. xiii+468; figs. 467. Price 20s. London: McGraw Hill Publishing Co., Ltd.

Export Credit Insurance.—The principal banks and business and trade organisations have received from the Department of Overseas Trade a *questionnaire* relating to insurance against bad debts contracted in the course of export trade. This circular asks if exporters are deterred from doing foreign business owing to the unsettled conditions in many parts of the world, with the consequent fear of non-payment for their goods; and what steps have been taken to cover such losses by insuring payments through insurance or other organisations, and with what results. It is also asked if an appreciable expansion of foreign trade would result if an insurance scheme were instituted. Details are requested of the main points with which such a scheme would have to deal.

Austrian Import Licences.—The *Board of Trade Journal* dated March 12th contained a revised list of goods for the importation and exportation of which into or from Austria special licences are required. The list includes water turbines, electrical machinery and accessories, and "electro-technical necessities (except accumulators and plates therefor, and electric carbons").

Proposed National Industrial Conference.—The National Alliance of Employers and Employed in a recent communication urged the Prime Minister to call together a national industrial conference, representative of employers' associations and trade unions, to consider the possibility and desirability of devising measures for joint or separate action to anticipate and avoid threatened industrial disputes.

Speaking in the House of Commons on March 11th, Mr. Baldwin said that when the Balfour Committee had reported he would consider whether such a conference might be usefully summoned, but he was convinced that there would be no advantage in calling together a national conference until there had been a frank and thorough discussion by the representatives of each of the principal industries with regard to the problem as it affected them.

At a meeting at Cambridge on March 9th, Lord Oxford and Asquith also appealed for a free and open conference of all the interests concerned, stating that it would open the way to a better understanding, a wider perspective, and a fuller and keener sense of the common interests binding the nation together, which was the only lasting foundation for peace and security.

Irish Free State Electrical Imports.—The imports of electrical machinery, apparatus and accessories into the Irish Free State during December last attained a value of £43,926, as compared with £47,126 in the preceding month—bringing the total for the whole of 1924 to £494,478. The appended table shows the details of the imports and the amount attributed to Great Britain and Northern Ireland, but it does not follow that they are all of British manufacture. Of the balance of £45,278 from foreign countries last year, £16,451 is attributed to Germany, £5,789 to Belgium, £13,577 to Switzerland, and £9,461 to "other countries."

	December. 1924. £	Twelve months, 1924. Total £	U.K. Share. £
Electric wires and cables ...	7,254	82,266	65,469
Telegraph and telephone instruments	1,213	28,531	28,406
Electric lamps and parts ...	2,625	25,183	23,621
Batteries and accumulators...	6,702	32,839	29,570
Electric lighting accessories and fittings	3,071	36,730	35,600
Radio sets and apparatus ...	5,695	93,753	91,414
Other electrical goods and apparatus	6,655	98,616	94,493
Electric generators	2,103	13,313	12,265
Electric motors	1,840	17,330	16,585
Other electrical machinery ...	6,768	65,917	51,777
	£43,926	£494,478	£449,200

The Trade Facilities Acts.—The *Board of Trade Journal* for March 12th contained an article upon the operation of the Trade Facilities Acts by the Secretary of the Advisory Committee appointed by the Act of 1921. This stated, *inter alia*, that the original maximum capital sum which the Treasury could guarantee was £25,000,000. This was subsequently raised to £65,000,000, and further legislation will increase it to £70,000,000. The Treasury cannot make loans, it can only guarantee them to enable the applicant to raise money for works of a capital nature on reasonable terms. Before guaranteeing a loan the Treasury requires to be satisfied as to the status, operation and management of the company applying for assistance, and as to the financial soundness of the schemes put forward. The Committee is anxious, also, to ensure that no scheme shall receive assistance which can be carried out without the Government guarantee. The guarantee can be given in respect of projects in any part of the world provided that the proceeds of the guaranteed loan are expended in Great Britain. By the Trade Facilities Act of 1924, the Treasury was authorised to make a grant of not exceeding three-quarters of the interest for a period not exceeding five years in respect of the expenditure in Great Britain upon a public utility undertaking in some parts of the Overseas Dominions, provided that the scheme is approved by the Government of that part of the Dominions. The address of the Advisory Committee is 3, Bank Buildings, Princes Street, E.C.2.

Co-operation in Europe.—Sir Philip Dawson's recent observations on the industrial competitive activity of Germany are recalled when we note that he presided at the lecture delivered in the City of London on Monday last by Dr. Ernst Wendler, Secretary to the German Embassy. Dr. Wendler concluded his lecture with the remark that the economic powers of Europe were competing instead of co-operating, adding that there would come a time when Europe would no longer be able to face the waste of energy entailed by a competitive system of all against all. He expressed the view that the real purpose of all economy was not the increase of manufacture at all costs, but the rational and practical balance of interests and requirements. Baron von Stamm, the German Ambassador, expressed a hope that there would be Anglo-German co-operation.

Admission to Industrial Council.—At the meeting of the District Council (No. 2) for the Electricity Supply Industry (Yorkshire, &c.) an application for admission to membership of the Council and a request to be graded were received from the Frodingham Urban District Council. The Council resolved to admit Frodingham as a member, but postponed the question of grading until a consultation had taken place between the Frodingham electrical engineer and a representative of the trade union side of the District Council.

New French Companies.—La Société d'Applications Thermodynamiques is the name of a new company which has lately been formed in Paris (44, Rue de Naples), with a capital of 2 million francs.

The Société Electrique de Normandie has been formed, with a capital of 1,000,000 fr. Its objects are the acquisition and working of electricity, gas, water, or refrigeration undertakings. Offices, 66, Rue de la Chaussée d'Antin, Paris.

The Société de Batteries d'Accumulateurs has been formed to work the licences for the "Press-o-lite" accumulators in France and her colonies. The capital is 1,000,000 fr. The capital may be raised, at option, to 1,200,000 fr. Offices, 7, Place de la République, Paris.

New Indian Company.—Among the new companies recently formed in India is the Agra Electric Stores Co., of Johri Bazai, Agra, with a capital of 40,000 rupees.

Engineering Employés' Wages.—The March issue of the *Monthly Journal* of the Amalgamated Engineering Union contains a report by Mr. J. T. Brownlie (the president) of the recent proceedings with regard to the men's claim for increased wages.

In another part of the journal some editorial comment on the subject appears. This expresses regret that "side issues" should have been introduced by the employers in replying to the claim, and states that "there is nothing to prevent them from raising such questions at any time after a settlement of our wages claim has been arrived at." What is perhaps a foreshadowing of a change of policy occurs in the following passage:—"There can be no doubt whatever that there is an improvement in the engineering industry as compared with twelve months ago, and overtime is being worked in many shops. If, as seems to be the case, we are to wait until every firm connected with the Employers' Federation can be proved to be full up with orders, then it is not unfair to suggest that to continue the process of making application for advances of wages on a national basis will adversely affect the interests of our members, and a return to local or district applications will, we feel sure, be insisted upon."

The article concludes by saying that confidence is felt that the men's claim is in every respect reasonable, and if the matter were to be referred to an impartial authority, the verdict would be overwhelmingly in their favour.

For Sale.—Mansfield Corporation Electricity Department invites offers for surplus steam-driven electric generating plant. (See our advertisement pages to-day.)

Conditions in China.—In the course of a review of the economic condition of China, *Commerce Reports* says:—A survey of China's trade as a whole over a long period of time shows no great change by reason of purely domestic causes. A country larger than the United States in area, with probably four times our population, China will always possess large districts and entire provinces where economic developments can proceed unhampered by internal disorders. The remarkable character of the Chinese has enabled the country to emerge from its various disturbances with little or no permanent ill effect from an economic standpoint.

German Electrical Exhibition. — A special exhibition of modern electric light fittings and accessories is to be held in Berlin from April 25th to 29th next.

New Australian Cement Works.—The Sulphide Corporation is erecting a large cement works at Cockle Creek, N.S.W. This works will have an initial output of 30,000 tons a year, states the *Financial Times*, but the arrangements will be such as to make the provision of 60,000 or 90,000 tons a year a matter of adding the necessary machinery to the buildings, which will be designed to accommodate this extra plant. Electric power will be taken from the Railway Commissioners, but an auxiliary supply will be available from the Corporation's own station in case of emergency.

Chinese Notes.—The Chee Hsin Engineering Works at Tongshan on the Peking-Mukden Railway, has erected a most up-to-date plant for the production of industrial machinery. The works is entirely electrically driven. The larger machines are all equipped with individual drive while the smaller machines are driven in groups by motors. A number of electric cranes of various capacities have been installed, and the steel foundry, now in course of erection, will house a half-ton Siemens arc furnace and a 1-ton Bessemer converter. A well-equipped metallurgical laboratory is being provided and an efficient accounting system instituted.

The Ta Yu Li Electric Co., Hangchow, has decided to increase its capital from $1,000,000 to $3,000,000. Plans for the construction of tramways are being considered. The company earned a net profit of $430,000 during 1924.

The Ming Ming Electric Light Co., Chinhai (Chekiang Province), is extending its operations and is raising its capital from $50,000 to $100,000.

Lighting and Power Notes.

Australia.—MELBOURNE.—The report of the Melbourne Electric Supply Co. for the year ended August 31st last shows that the number of consumers was 92,649, the total connections 163,700 kW, and the amount of energy sold 87,800,000 kWh. The previous year's figures were:—Consumers, 80,597; connections, 131,600 kW; energy sold, 73,500,000 kWh. The Geelong undertaking has been reconstructed and the supply changed over from d.c. to a.c. 3-phase. One 3,000-kW turbo-alternator and two water-tube boilers were installed during the year.

QUEENSLAND.—The Government has received a report from Mr. W. Corin, consulting engineer, of Sydney, in favour of the proposal to use the Barron Falls for generating electricity. The power available during normal periods is estimated at 10,500 h.p., and in dry seasons 3,500 h.p.

NEW SOUTH WALES.—According to the *Electrical Engineer of Australia and New Zealand*, the Public Works Department states that the construction of the Burrinjuck hydro-electric scheme is now well in hand. The transmission system, which is under construction, consists primarily of two lines from Burrinjuck, one to Gundagai and Junee in the west, and the other north to Harden through Cootamundra. It is anticipated that a supply to Junee will be available by February, 1926. The plant to be installed at Burrinjuck includes two 5,000-kW alternators. Electricity will be generated at 6,600 V and stepped up to 66,000 V for transmission.

Barking.—INAUGURATION OF POWER STATION.—At the annual meeting of the County of London Electric Supply Co., Ltd., on March 16th, Sir Harry Renwick stated that the King had consented to open the Barking power station, erected by the company, on May 19th.

Barnes.—LOANS SANCTIONED.—The Urban District Council has received sanction to the borrowing of £30,929 for the following purposes:—Mains and services, £20,535; purchase of land, £2,750; buildings, £2,130; plant, £5,514.

Basingstoke.—NEW PLANT.—The Electricity Commissioners have given consent to the extension of the Council's existing generating plant by the installation of a 410-kW Diesel set.

Bradford.—ELECTRICITY SUPPLY.—The Electricity Committee has authorised the provision and equipment of a district transforming chamber at Listerhills Road, at an estimated cost of £2,635.

Bristol.—ELECTRICITY EXTENSIONS.—The Electricity Committee has provisionally made arrangements for supplying electricity to the Bristol Aeroplane Co., Ltd., at its Filton Aerodrome. The supply will involve the laying of an e.h.p. main from Horfield, and at the same time, in view of the rapid developments which are taking place along the line of route, the Committee proposes to lay a l.p. main with a view to meeting the demands arising from these developments, the estimated cost of the works being £11,470.

The Committee proposes laying a second feeder to Horfield for the purpose of supplementing the high-pressure supply, at a cost of £8,919.

Owing to the growth of the undertaking, the Committee states that it is necessary to provide the following plant:—Feeder Road works: One 7,000-kVA, three-phase turbo-alternator, complete with condensing plant, pipe work, switchgear, &c.; the construction of the fifth instalment of the boiler house, including the installation of two 35,000-lb. boilers, complete with economisers, superheaters, forced and induced draught plant, stack, pipe work, &c. Temple Back sub-station: One 1,000-kVA converter, complete with control gear, cables, &c. The estimated total cost of the whole of the works involved, which includes the necessary structural alterations and additions, is £92,490.

Burton-on-Trent.—EXTENSION OF SUPPLY.—The Electricity Committee has approved a report submitted by the electrical engineer on the extension of the electricity supply to Woodville, and has recommended to the Town Council that the scheme be carried out. The cost is estimated at £31,865.

Canada.—NEW BRUNSWICK.—The announcement was made in the speech from the throne at the opening of the New Brunswick Legislature on March 12th, that legislation would be introduced to enable the development of the Grand Falls, on the Saint John River, for electric power purposes. All the preparatory work in connection with this big project has been completed. The final decision by the International Waterways Commission to permit the undertaking is expected this month.—*Reuter* (Fredericton, N.B.).

Carlisle.—LOAN.—Sanction is being sought to a loan of £5,175 for extension of mains.

Ceylon.—HYDRO-ELECTRIC SCHEME.—Work will shortly be commenced on the hydro-electric scheme for the supply of electricity to a considerable portion of the island, including Colombo.

Chile.—HYDRO-ELECTRIC DEVELOPMENT.—It is reported that a scheme is proposed for the erection of a hydro-electric power station at Huilo-Huilo Falls with an initial capacity of 30,000 h.p., and a possible ultimate development of 120,000 h.p. The electricity generated would be used mainly for industrial purposes, including the manufacture of paper and calcium carbide.

Chirk.—INAUGURATION OF SUPPLY.—The electricity undertaking of the Chirk Electricity Supply Co., Ltd., was formally inaugurated by Lord Trevor on March 14th. The installation work was carried out by Messrs. A. R. Gamble & Sons, of Leicester.

Continental.—BULGARIA.—The construction of the large power station begun in 1922 by the Orion company has now been completed. The station utilises the Rila water, and is connected up with the Pastra plant. The plant, when fully installed, will have a capacity of 15,400 h.p., with 3,300 h.p. at low water. The company is to erect three transformer stations, at Dupnitze, Zerkwa, and Batanofzi, from which it will distribute electrical energy at a pressure of 15,000 V to all the neighbouring towns, villages, and industrial establishments, thus providing electricity for the whole of Western Bulgaria. The enterprise represents at its present stage a value of about 120 million leva.—*Reuter's Trade Service* (Sofia).

CZECHO-SLOVAKIA.—It is expected that work on the construction of a new water-power plant will be begun on the Vetzva (Moldau) River, near Prague, during the summer of 1925. Probably three turbines will be installed, and the annual production is expected to amount to 130,000,000 kWh.—*Commerce Reports.*

FRANCE.—La Société de l'Energie Electriqué de Labastide-Murad is the name of a new company which has lately been formed at Labastide Murad (Lot Department), with a capital of 180,000 fr., to undertake electricity supply in the town.

A new company has lately been organised in Paris, with a capital of one million francs and the title La Société l'Electrique de Normandie, to establish electricity supply undertakings in Normandy.

ITALY.—At a recent joint meeting of representatives of the four Italian provinces of Cuneo, Alexandria, Novara, and Imperia, approval was given to a scheme submitted by a syndicate for the establishment of plants to utilise the power of the River Tanaro. It is proposed to dam the river at five different points above the town of Ceva. The scheme provides for the establishment of five power stations of an aggregate annual output of 182 million kWh. Three of the plants would supply electricity to Liguria and two to the Piedmont area.

BELGIUM.—A new company has been formed in Brussels, with a capital of three million fr. and the title La Société Tirlemontoise d'Electricité, to undertake electricity supply in the Tirlemont district. The Société Générale Belge de Distribution Electrique, of Brussels, is interested in the new undertaking.

SWITZERLAND.—Ever since 1905, the current for the supply of electricity to the communes of Entlebuch and Hasle, near Lucerne, has been supplied from a central station established by a local textile manufacturing firm. As the demand increased, instead of extending the plant, it was decided to draw the additional supply from the power station of the Central Switzerland Power Co., the firm establishing two transformer and distribution stations for this purpose. Terms have now been arranged whereby the Central Switzerland Co. will, as from July 1st, take over the plant and distribution system on its own account.

Finchley.—LOAN SANCTIONED.—The Town Council has received consent to the borrowing of £33,300 for plant extension.

Gravesend.—NEW PLANT.—The Corporation has received sanction to the extension of its power station in connection with the extension of its electricity supply to Northfleet.

LOAN SANCTION.—Sanction has also been received to a loan of £15,000 for mains and services.

Hamilton.—INQUIRY.—The Electricity Commissioners have decided to hold an inquiry into the application of the Town Council for consent to the extension of its generating station. It is understood that the inquiry will be as to whether the additional supply desired shall be obtained from the Clyde Valley Electric Power Co., or whether the Corporation station should be extended to give this supply.

PROPOSED NEW STATION.—The Town Council is considering a proposal to erect at Clyde Bridge a hydro-electric plant capable of generating 2,000,000 kWh per annum, and has instructed Mr. T. Arnot, mining engineer, Edinburgh, to report as to the stability of the ground in the neighbourhood. The estimated cost of the scheme is £44,000.

Harrogate.—LOAN.—The Town Council is applying for sanction to borrow £5,300 for a new h.p. switchboard and other purposes.

Hastings.—ELECTRICITY EXTENSIONS.—The Town Council is applying for a Special Order to supply electricity outside the borough. It is proposed to extend the mains to Westfield, Breed, Udimore, Rye, Winchelsea, Seddlescombe, Battle, Northiam, Beckley, Broad Oak, Fairlight, and Mountfield. The estimated cost of the scheme is £68,707, and it is proposed to ask the Electricity Commissioners to fix the maximum price to ordinary consumers at 1*s.* per kWh.

Hazel Grove and Bramhall.—Loans Sanctioned.—The Urban District Council has received sanction to loans amounting to £10,424 for electricity purposes.

Heston-Isleworth.—New Plant.—Mr. H. J. Nias, J.P., chairman of the Electricity Committee, started the new turbine that has been installed at the electricity works on March 7th, and said the undertaking was in its 21st year of working. The original scheme included direct-current generators, a storage battery, and a refuse destructor, the latter supplying steam continuously until 1921, when it was closed down. In 1914 the plant was of 1,250 kW, and the accumulators 540-Ah capacity. The Council, in 1918, made application to extend the plant, but permission was refused, and the Council made an agreement with the Twickenham Co. for a bulk supply for seven years of alternating current at 7,000 volts, and converting machinery was installed for direct current. Application was made for leave to install additional plant in 1922. The Electricity Commissioners told the Council that its works were among the first scheduled to be closed down, and advised the Council to obtain a bulk supply from the Metropolitan Power Co., in which suggestion the Council saw no advantage, and decided instead to replace the old machinery with new plant, but permission to do so was also refused by the Commissioners, who, however, later agreed that the change was a replacement and not an extension. The new machine was built by Messrs. Fraser & Chalmers. In 1914 there were connected 786 consumers; in 1919, 1,032; and in 1924, 2,536. The energy sold in 1919 amounted to 1,505,764 kWh; and in 1924, 2,290,416 kWh. The maximum load in 1919 was 842 kilowatts; and in 1924 1,624 kW. The plant was 2,543 h.p., equivalent to 1,880 kilowatts. Three industries in the district have closed down; if they restarted they would require an additional 1,500 h.p.

India.—Ahmedabad.—According to the *Indian Textile Journal*, the extension of the generating plant of the Ahmedabad Electricity Co., Ltd., has recently been completed. The total capacity of the plant is 2,300 kW, and alternating current supplied for municipal and private lighting and industrial power purposes is generated at 3,300 V, 3-phase, 50 cycles. The plant consists of five 240-b.h.p. Diesel engines and three of 750 b.h.p. manufactured by Messrs. Mirrlees, Bickerton & Day. The five small alternators are of Messrs. Crompton's manufacture, whilst three larger alternators and the h.p. switchboard were supplied by the British Thomson-Houston Co., Ltd.

Madras.—Important enterprises on the Nilgiris have been discussed by the Government of Madras and various persons interested in hydro-electric schemes. The Government will soon make an announcement on the subject and initiate the Pykara scheme. The immediate starting of the Papanasam power scheme is probable. A supplementary grant for the continuance and expansion of the staff engaged on the investigation of hydro-electric projects in the Presidency has been requested. A large water project involving the construction of an artificial lake at Jharia, Bihar, and Orissa has just been initiated by the Provincial Government.—*Commerce Reports.*

Irish Free State.—Killorglin (Co. Kerry).—A scheme is proposed for the electric lighting of the town. The Killarney Rural District Council has the undertaking in hand, and is seeking urban powers for the purpose. The estimated cost of the public lighting of the town, according to the proposal of the Killorglin Electric Power Co., Ltd., is £50 per annum.

Java.—Hydro-Electric Scheme.—*Commerce Reports* states that a hydro-electric power station is to be erected near the city of Soerabaya with a capacity of 30,000 h.p. The electrical energy will be distributed to numerous industrial and agricultural centres. It is anticipated that construction work will be started about the middle of this year.

Northern Ireland.—Castleblaney (Co. Monaghan).—The Urban District Council has given notice to terminate the contract and wayleaves in connection with the electric lighting scheme. It is believed the scheme will be revived when the Free State scheme for the harnessing of the Shannon comes into operation.

Paisley.—Street Lighting.—A scheme providing for lighting entirely by electricity the main street at a cost of £1,219, as compared with the existing system of partly electricity and partly gas, at an annual cost of £1,144, has been approved by the Town Council.

Portsmouth.—Loans.—The Electricity Committee has recommended to the Town Council that application be made for sanction to borrow £12,000 for transformers and sub-station equipment, and £11,000 in respect of rotary plant and buildings necessitated by the supply of electrical energy to the Tramways Department.

Extension of Supply.—The Committee has also recommended that the scheme for supplying electricity to Hayling Island by means of underground cables be proceeded with at an estimated cost of £15,000. The estimated revenue from this scheme is £1,800 per annum.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Tonbridge.—Lighting: Maximum demand rate to be discontinued and all consumers supplied at a flat rate of 6d. per kWh. Power: Sliding scale of 4d. and 3d. to be discontinued and a flat rate of 3d. per kWh substituted. Maximum demand rate: 3d. per kWh for the first 100 kWh per kW of maximum demand per quarter, and 2d. per kWh beyond, with a minimum payment of £50 per quarter.

St. Marylebone.—Lighting.—Flat rate: From 5d. to 4½d. per kWh. Slot meter: From 5½d. to 5d. per kWh. Long term and annual contract rate: The percentage charge on the schedule kW charge to be abolished. Maximum demand rate: From 8d. and 1d. per kWh for 200 hours each winter quarter and 100 hours each summer quarter to 8d. and 1d. per kWh for 200 hours (winter) and 50 hours (summer). Outside signs: From 3d. to 2d. per kWh.

Canterbury.—Lighting: Varying from 6d. to 5d. according to quantity consumed. Maximum demand system: 100 hours per quarter, 9d. and 3d. per kWh. Power: Varying from 1½d. to 1¼d. according to quantity consumed. Heating, cooking, and other domestic purposes: Flat rate of 1½d. per kWh.

Dewsbury.—Street lighting: 2½d. per kWh.

Dublin.—A reduction of 1d. per kWh for lighting, with other minor modifications, including a new rate for domestic purposes.

Whitehaven.—Lighting: Flat rate, from 6d. to 5½d. per kWh. Maximum demand rate: From 2½d. to 2¼d. per kWh.

Douglas (I. of M.).—Lighting: Flat rate, from 9d. to 8d. per kWh. Power: From 4d. to 3d. per kWh. Meter rents have also been reduced.

Spalding.—Electricity Scheme.—The Rural District Council has informed the Urban District Council that it will not oppose the new Electricity Order if the maximum price for electricity is reduced from 1s. to 10d. per kWh. The Urban Council has given an assurance that the maximum price will be fixed at 10d.

Stockport.—Electricity in Bulk.—The Town Council has offered a supply of electricity in bulk to Marple and New Mills on the same terms as apply to Hazel Grove and Bramhall.

Truro.—Electricity Supply.—In connection with the electricity supply for the town, the Electric Lighting Committee has considered the proposal of the Cornwall Electric Power Co. and Messrs. Edmundson's Electricity Corporation, Ltd., to form a company to supply Truro, and has recommended to the Town Council that the scheme of a municipal supply be abandoned and that the Council publicly invite offers for an electricity supply for the town.

United States.—Electrical Development.—The *Electrical World* reports that it is announced that the Western Power Corporation proposes to spend over $200,000,000 on electricity schemes in California within ten years, including the development of 1,000,000 h.p. on King's river and the North Fork on the Feather river, and the inter-connection of the undertakings of its subsidiaries, the Joaquin Light and Power Corporation and the Great Western Power Co. It is stated that the inter-connecting system will be about 100 miles in length and may extend from Antioch on the north and Newman on the south. Work on this portion of the scheme will commence within a few months.

Tramway and Railway Notes.

Australia.—Melbourne.—The Melbourne Tramways Board has put into service a fleet of 45 omnibuses. It is intended to run them in competition with the services of private companies and also to use them as auxiliaries to the Board's tramway services.

Blackpool.—Tramway Improvements.—The proposed expenditure by the Highways Department during the coming year totals over £450,000, and includes:—Tramways: South Shore, £10,000; Gynn-Talbot Square, £2,000; Talbot Road, Abingdon Street to Swainson Street, £2,000; Gorton Street to Coleridge Street, £1,000; Elizabeth Street to Gorton Street, £2,700; Marton, Talbot Square to Park Road, £12,000; Waterloo Road, St. Annes Road, to Lytham Road, £4,000.

Brazil.—New Electric Railway.—According to *Commerce Reports*, the construction of an electric railway from Caracol to Espirito Santo do Puihal, in the State of Minas Geraes, is proposed.

Continental.—Sweden.—The construction of the new electric locomotives for the West Swedish main line, which is now being completely electrified, is well under way at the Asea works in Västeras. The locomotives which are to run between Stockholm and Gothenburg are built of one type only for both goods and passenger service. By means of an ingenious system of gears the express locomotives can be adapted for goods service in a very brief space of time. The express trains will have a weight of about 500 tons, exclusive of the locomotive, and will be run at 90 km. on the level and 60 km. on 10 per cent. grades, the corresponding figures for a goods train of 900 tons' weight being 70 km. and 35 km. The time of the express run between Stockholm and Gothenburg will be reduced from about nine to seven hours.—*Swedish Export.*

SPAIN.—Work will shortly commence on the electrification of the first section, as far as Algorta, of the Bilbao-Las Arenas-Plencia railway.

SWITZERLAND.—The Swiss Federal Railway authorities in Berne have recently voted a credit of 5,484,000 fr. in respect of the electrification of the railway between Brugg and Pratteln, a distance of about 30 miles, work on which is about to be commenced.

GREECE.—Electricians in Athens struck work on March 14th. A service on the Athens-Piræus Electric Railway is being maintained and the electricity supply is being continued with the aid of sailors. The tramway service in the city has been suspended.

Liverpool.—INQUIRY.—The Ministry of Transport held an inquiry at Liverpool on March 13th into the proposal of the Corporation to lay tramway track along Ullet Road. For the Corporation the Deputy Town Clerk said the length of the proposed line was 1,080 yards, of which 800 yards was single track and 280 yards double track. The inclusive estimate of the cost was £14,500. Mr. Maples, on behalf of residents of Ullet Road, asked that the Ministry should refuse its consent, as the scheme would materially reduce the value of property in Ullet Road. The Deputy Town Clerk stated that the Corporation would pay compensation so far as private rights were concerned.

PROPOSED SUBWAY.—It is stated that the Corporation is considering the question of a subway for tramcars from Everton to the centre of the city.—*Modern Transport.*

Morocco.—RAILWAY ELECTRIFICATION.—Work is well in hand on the electrification of the railway between Casablanca and Kourigha and between Casablanca and Rabat in French Morocco. The power station is already completed, and the electrified lines are expected to be opened for traffic by the end of June next.

Southport.—ROUTE TO BE ABANDONED.—The Tramways Committee has decided to close the circle route as from the 31st inst. This route was only re-established some few months ago, after a lapse of several years, and new track was laid down to give a wider service, but expenses, despite the working of a one-man car on the route, have been far greater than the income.

Sunderland.—TRAMWAY EXTENSIONS.—At a meeting of the Town Council a resolution to defer proceeding with tramway extensions along Durham Road and a loop *via* Derwent Street until a report had been made made on the comparative cost of tramways and 'bus services was defeated. The chairman of the Tramways Committee opposed the motion on the ground that for a town like Sunderland, with a dense population, tramcars were undoubtedly the best and cheapest form of transport.

Wolverhampton.—RAILLESS CARS.—The railless-car system on the Bushbury route of the Corporation tramway was inaugurated on March 9th. This is the second route which has been converted to railless traction, and it has been extended to Fordhouses, 1¼ miles past the original terminus. The cost of the conversion was £22,000. It has already been decided to convert the Dudley route to railless traction, and further powers are being applied for to deal with other routes in the town if found desirable.

Telegraph and Telephone Notes.

Ceylon.—SHIP-TO-SHORE TELEPHONY.—The Colombo Port Commission is considering the desirability of connecting ships in the harbour with the telephone system. Vessels at Colombo do not go alongside wharves, but are berthed far out, with the result that shore communication with a ship is only possible by some one going afloat, and many an urgent message is thus delayed. According to *Indian Engineering*, the Telephone Department is willing to give effect to the proposal, but it would be a costly undertaking, as the Department has no stock of suitable armoured cable, and maintenance would be expensive.

Imperial Radio Communication.—ADVISORY COMMITTEE.—Sir William Mitchell-Thomson, the Postmaster-General, in a recent public speech, said that he had taken steps to try to bring about the formation of an Imperial Advisory Committee to assist the Post Office in the day-to-day practical working of Imperial wireless. He had invited from the Dominions, through the Colonial Office, their views upon this proposal, and if they were favourable the Committee would be set up under the chairmanship of the Assistant Postmaster-General.

AUSTRALIAN STATION SITES.—Another definite step forward has been taken by the selection of sites in Australia for stations for the proposed direct service between Australia, England, and Canada. According to the *Daily Telegraph*, two beam-transmitting stations will be erected six miles south of Ballan, on the main road between Melbourne and Ballarat, one for communicating with England in two directions, the other with Montreal. Two beam-receiving stations will be erected about 15 miles from Melbourne between the towns of Keilor and Sydenham. In both cases the stations will be operated by distant control from Melbourne. Feeder stations will be erected in the other capital cities. The work of erecting masts and buildings, connecting lines, and plant generally has commenced, and is expected to be concluded by the end of the year. The selection of sites was made with a view to the subsequent erection of additional stations for communicating with other countries.

SOUTH AFRICA.—The British Postmaster-General's recent statement in the House of Commons in connection with the sites for the stations of the Empire "wireless chain" is attracting widespread attention in South Africa. The South African Wireless Telegraph Co. emphasises that there has been no delay on the part of the Union Government. The company has been able to enter into a definite contract with the Union Government that the "beam" system in South Africa will be ready by September 1st.—*Reuter* (Capetown).

Italy.—AMERICAN CABLE SERVICE.—A new cable service between Anzino (13 miles south of the Tiber) in Italy, Malaga, and New York was inaugurated on March 16th.

Morocco.—CABLE SHIP ATTACKED.—Despite the hoisting of the Blue Ensign, Moors fired on the British cable ship *Amber* off the coast near Tangier, Rif, recently, says the *Daily Mail*, until they were subdued by shelling from a Spanish gunboat.

New Zealand.—AUTOMATIC TELEPHONY.—According to the *Electrical Engineer of Australia and New Zealand*, it is expected that the whole of the Auckland telephone system will be converted from manual to automatic working at an early date. The seven exchanges in the multi-office area will be "cut over" simultaneously. Automatic installations are in progress in Wellington, Dunedin, and Christchurch, and it is expected that the services in all of these cities will be cut over within 18 months. A new cable is to be laid to give telephonic communication between the North and South Islands. Messrs. Siemens Bros. & Co., Ltd., have entered into a contract for the supply of the submarine cable which will be 35 nautical miles in length, with four conductors used in conjunction with repeaters, the supply of which is part of the contract. The laying of this cable across Cook Straits will put the islands in telephonic communication for the first time.

Philippines.—NEW RADIO STATIONS.—According to the *Financial Times*, the Radio Corporation of America has completed negotiations with the United States Government for the erection of a high-power wireless installation at Manila at an estimated cost of $4,000,000. The transmitting station will be on the Mariveles Peninsula, while the receiving station is to be situated three miles distant, with an underground cable connecting the two. Both will be controlled from the centre of the business community in Manila.

Portugal.—NEW RADIO STATIONS.—The Minister of Commerce has introduced a Bill to modify the contract of 1922 with Marconi's Wireless Telegraph Co. requiring the company to have a capital of £300,000 in Lisbon and to keep two-thirds of its reserve capital as well as its offices in Portugal. Radio stations will be erected in Lisbon, Angola, Mozambique, Cape Verde, Madeira, and the Azores. The Lisbon station will be sufficiently powerful to communicate directly with Mozambique, South America, and with European capitals.—*Reuter* (Lisbon).

The Telephone Service.—PUBLIC KIOSKS.—The Post Office is to build six public telephone kiosks in the streets of Fulham.

Radio Notes.

Aerials.—CAMBRIDGE.—The Town Council has decided to impose a charge of 2s. 6d. yearly on every tenant of a Council house who erects a radio aerial.

PRESTWICH.—The Town Council of Prestwich, Lancashire, is requesting the removal of aerials that have been erected across public streets.

B.B.C. Policy.—OFFICIAL STATEMENT.—In view of the recent criticism of the British Broadcasting Co., Ltd., the official statement of facts and policy in the *Radio Times* of March 13th is of interest. It is pointed out that the estimated revenue for the present year is £480,000; payment is made by the Post Office to the B.B.C. two or three months in arrear, and there is a quarterly audit by the P.O. accountants. Of last year's expenditure between 50 and 60 per cent. was devoted to programmes; between 15 and 20 per cent. was absorbed in salaries and wages; and the balance of between 20 and 25 per cent. in miscellaneous charges, including rent, rates, taxes, engineering development, light, heat, power, and legal charges. Salaries, wages, and miscellaneous charges are now stabilising, and during this year an increasing proportion of revenue will be allotted to programmes. Additional funds accruing from the regularising of the licence position will go towards improving the programmes and developing the equipment. The present cost of the service to the listener is three programmes a penny. The B.B.C. was under contract to construct eight main stations, but it is now operating

21 stations, and no less than 80 per cent. of the population of these islands is within crystal range of some station. Moreover, 35 per cent. of the population can choose between two simultaneous services, also on a crystal.

Extensive technical improvements are in hand. The 10,000 miles of land-lines of the system require attention. As soon as funds are available it is proposed to break up the long land-lines with repeater apparatus, and to provide new correction instruments at the receiver end. Improvements in method are so rapid that a great deal of the transmitting equipment which a few months ago was up-to-date is now obsolescent. Substitution is being undertaken generally, and this will probably be a recurring charge. Programmes are being improved, and negotiations with the entertainment industry promise to release some material hitherto denied the company. The new technique of the radio-drama is making rapid strides.

British Guiana.—BAN LIFTED.—The prohibition of the use of radio sets in British Guiana was removed recently, and a small market is expected, says *Commerce Reports*. Receiving sets are licensed by the Government at $3 per year.

Station Interference.—LONDON CONFERENCE.—The British Broadcasting Co., Ltd., convened an informal international conference of the leading European concerns in London on Wednesday last to deal primarily with questions of mutual interference as between British and European broadcasting stations. Methods of preventing such interference in the future were explored.

Britain, France, Italy, Germany, Spain, Holland, Sweden, Czecho-Slovakia, and Austria were to be represented, but the delegates are not being assisted by their respective Governments, mutual arrangement being the basis. It is understood that the arranging of international programmes and methods of relaying them were to be discussed. Matters affecting broadcasting on these lines have been submitted to the League of Nations, which decided to do nothing in advance of the general international conference on wireless telegraphy which is to take place at Washington some time next year. According to the *Evening News*, the Government, through the Post Office, is inclined to the same attitude. The broadcasting authorities, however, take the view that these matters are of sufficient importance in themselves and the need for dealing with them is so urgent that they should be regarded as distinct from telegraphy and other points of radio communication generally.

Switzerland.—RADIO TELEPHONY.—The Department of Overseas Trade is informed that the municipal authorities at Lausanne are contemplating a transformation of the existing radio station at the Champ-de-l'Air, which is to be equipped with a new transmitter specially adapted for broadcasting, and a microphone of the latest approved design. The Cantonal authorities are stated to be taking practical interest in this transformation. Satisfactory progress is being made with the construction of the station at Basle. The necessary buildings have now been erected, so that the installation of the apparatus and aerial can be proceeded with at once. Proposals have been put forward for the equipment of the station for broadcasting, but the opinion of competent local authorities is divided as to the desirability of doing so, as the station is being built primarily for civil aviation purposes. The number of receiving sets licensed by the Federal authorities up to the end of 1924 was 16,964. The considerable increase which took place during 1924 is chiefly attributed to the opening of the Zurich-Hoengg broadcasting station in August. The first general meeting of the Association of Swiss Wireless Dealers, held in Zurich on February 21st, confirmed the unanimity of the views held by the Federal authorities and those of private interests as to the desirability of establishing the trade on a sound and healthy basis by eliminating "occasional" dealers. Considerable progress is stated to have already been made in this direction.

The Wireless League.—NEW ASSOCIATION PROPOSED.—The constructor and experimenter have their society, and the B.B.C. is an organisation of manufacturers, but listeners have no means of expressing their wants, urging their claims, or obtaining redress for their grievances. Therefore, the *Daily Express* has decided to help in the formation of the Wireless League, the objects of which will be to represent, voice, and defend the interests of all persons who receive the broadcast programmes of this and other countries. When the new association is set up, the *Daily Express* will leave it to its own properly constituted authorities. The proposal is to form a central committee in London to launch the new central association at once; to establish branch associations throughout the whole kingdom, and to arrange that each branch shall have a voice, either by vote or delegate, in the *personnel* and policy of the central body. Such an association would be entirely independent and self-supporting, and represent no other interest than that of the listener. The League will give listeners the organised strength to claim a fair number of seats on the board of the B.B.C.; put forward the views of members as a united body; protect them; and afford them technical advice, free of charge, regarding receivers and installations.

The following have consented to become members of the provisional committee, which will perform the necessary preliminary work leading up to the appointment of officials and a representative general committee:—Lord Lambourne, Lord Dawson of Penn, Sir Landon Ronald, Sir Arthur Conan Doyle, Sir Edward Marshall-Hall, K.C., Sir Frederic Wise, M.P., Dame Beatrix Hudson Lyall, Mr. F. Dudley Docker, C.B., Mr. H. G. Tyrwhitt Drake, and Mr. Percy W. Rootham.

Transatlantic Broadcasting.—DOUBLE RELAYING.—During the night of March 14th-15th American towns listened to the Savoy Hotel orchestra, the occasion being the first successful experiment in double relaying. At 6.15 New York time (London 11.15 p.m.), music from Savoy Court, London (2LO station) was picked up at Belfast, Maine, on a 3-miles-long aerial and super-heterodyne circuit, amplified, and again broadcast on a 112-metre wave-length, caught at the Radio Corporation's test station at Van Cortland Park, New York, carried over a land wire to the main broadcasting station, and thence sent out on a 467-metre wave-length.

United States.—NATIONAL ELECTRIC CODE REVISION.—The Electrical Committee of the National Fire Protection Association held a series of sessions in New York during February for the purpose of revising the provisions of the Code for publication in the 1925 manual. Changes made in the Code requirements are based upon wide experience with radio installations since the 1923 edition was published.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

Open.

Adwick-le-Street.—April 6th. Urban District Council. Sub-station equipment, h.p. and l.p. joint boxes and cables, distribution pillars, &c. (March 6th.)

Ashford.—March 30th. Electricity Department. Power house building and 10-ton hand-operated overhead travelling crane. (March 13th.)

April 6th. Transformers. (See this issue.)

Australia.—MELBOURNE.—May 4th. Victorian Government Railways. 15 potential transformers.*

BRISBANE.—May 27th. Brisbane Tramway Trust. Tramway sub-station equipments, *viz.*, converters, transformers, and switchgear for six stations. Specifications from the office of the Melbourne and Metropolitan Tramways Board, Melbourne.

SYDNEY.—May 12th. Postmaster-General's Department. Accumulator and counter e.m.f. cell batteries.*

Ayrshire.—March 30th. Education Authority. Electric lighting at St. Joseph's R.C. school, Kilmarnock. Schedules from Mr. W. Reid, master of works, Education Office, Ayr.

Bedford.—March 25th. Electricity Department. E.h.p., h.p. and l.p. cables for 12 months. (March 6th.)

Belgium.—March 23rd. Municipal authorities of Molenbeck-Saint Jean, Brussels. 1,000 electricity meters. Particulars from Hotel de Ville.

April 22nd. Provincial authorities at Namur (35, Rue du College). Establishment of a provincial high-pressure distribution system to supply the communes of Marienbourg, Frasnes, and Petigny.

Bridlington.—March 30th. Electricity Department. Mechanical stokers, grates, forced-draught plant, coal elevators, hoppers and superheaters for Lancashire boilers. (See this issue.)

Bristol.—April 16th. Electricity Department. One 7,000-kW turbo-alternator, with condensing plant and auxiliaries. (See this issue.)

March 23rd. Board of Guardians. Clutton Union. Generating plant and electric lighting installation at the Temple Cloud Institution. Specifications from Mr. A. P. I. Cotterell, 17, Old Queen Street, S.W.1.

Chile.—SANTIAGO.—May 14th. Inspeccion-General de Hidraulica. Four 3-ton electrically-operated cranes and one 20-ton ditto.*

Erith.—March 27th. Electricity Department. E.h.p. transformers. (March 13th.)

Egypt.—CAIRO.—April 30th. General Manager, Egyptian State Railways, Telegraphs and Telephones, Cairo Station. Manual c.b. telephone exchange for 6,000 subscribers' lines, also 3,000 table and 700 wall telephones, &c. Copy of the specification (L.E. 5) from Stores Department, Saptia (Cairo) or Gabbary (Alexandria), also at the office of the Administration's Inspecting Engineer, Queen Anne's Chambers, S.W.1.

May 2nd. 8,000 metres of submarine cable, 45 tons h.d. copper wire, &c., for telephones, 19,630 metres of cable. Inspecting Engineer in London.

April 4th. 1,900 electricity meters for various towns. Director of the Section of Municipalities and Local Commissions, Savoy House, Cairo.—*Reuter's Trade Service* (Cairo).

(Continued on page 463.)

The Electric Driving of Large Cotton Spinning Mills.

A RECENT visit to Messrs. Cannon Bros.' Stanley Mills at Bolton afforded us the opportunity of seeing an excellent example of what can be achieved with efficiency in the conversion, with extensive additions, to electric from steam drive of large power-driven mills and how electric drives can be utilised so as to reduce to a minimum the space not used directly for productive work.

The mills, which originally consisted of 63,000 steam-driven spindles, are now working a total of 203,000 electrically-driven spindles, and the additions have been made without in any way hindering the working of the mills or temporarily impeding the progress of the spinning. The machinery is engaged upon super-combed qualities of cotton doubling weft, pin cop and manufacturing twist in counts ranging from 40's to 160's. Fig. 1 shows a general view of some of the spinning mules in one of the main spinning rooms.

Fig. 1.—Some of the Mule Spinning Machines.

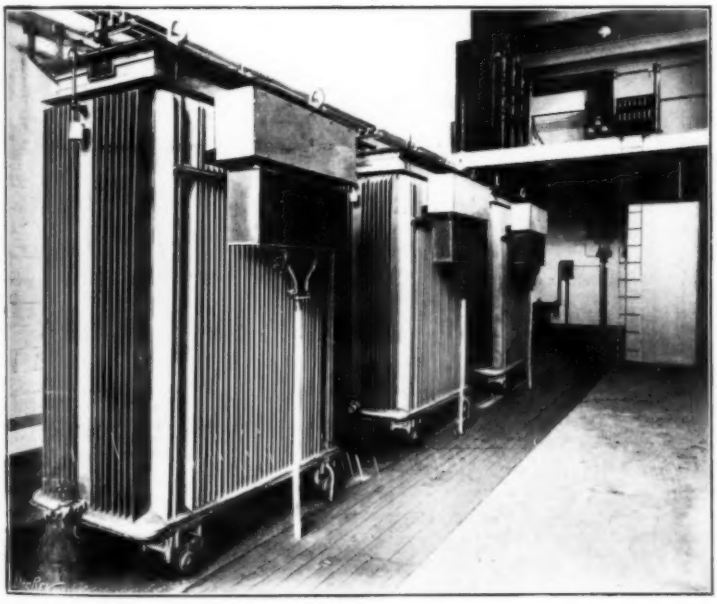


Fig. 2. Interior of Sub-station.

The first addition to the original plant, which was driven from a coupled compound condensing engine through spur and bevel gearing, consisted of 45,000 spindles, and a temporary electric sub-station was provided to supply this addition. A second addition consisted of 95,000 spindles, the completion of which was followed by the complete conversion of the original machinery to electric drive; the absence of second-motion drives has resulted in the very even running of an extensive installation.

A 6,600-V, 3-phase supply at 50 periods is obtained from the Bolton Corporation Back-o'-th'-Bank station by means of a .2 sq. in. supply cable, and is transformed down to 400 volts in the mill sub-station, and a second cable from the mains acts as a stand-by. The high-pressure input is controlled by mechanical remote-control switchgear, and the low-pressure output by direct switching from the switch gallery. Fig. 2, an interior view of the sub-station, shows the three transformers at present installed. Provision is made for the installation of two additional transformers, and the necessary switchgear for these is already installed. The low-pressure switchgear has been supplied by Messrs. J. H. Holmes & Co., and the high-pressure switchgear by the Park Royal Engineering Co. The three transformers are of the Brush Electrical Engineering Co.'s make and of 600 kVA capacity. Fig 6, p. 460, shows the h.p. oil-switch cubicles. The h.p. switch-control gear is shown in fig. 4, and the l.p. switchgear in fig. 3.

A portion of the boiler house has been converted, and is now used as the sub-station and switch gallery, while the engine room is now an extension of the blowing room. The gear chamber has been converted into blowing room extension, motor and motor-starting switchboard rooms, while the previous condensing water-cooling lodge is now a packing and storage cellar. The main banking busbars are carried to the motor-starting switchboard, where the starting gear for motors of 50 h.p. and upwards is grouped

Fig. 3.—L.P. Switch Control Gear.

into one ironclad switchboard. The motors installed throughout the mills are, with one exception, either squirrel-cage or slip-ring types, the slip-ring motors being above 186 h.p. The squirrel-cage motors are controlled by auto-transformer starters, and the slip-ring motors are controlled by motor-driven liquid starters designed by Mr. W. Browning, M.I.E.E., of Messrs. Kelly & Browning, the consulting engineers to Messrs. Cannon Bros., Ltd. These liquid starters necessitate only the closing of the main switch at starting, and the closing of the rings' short-circuiting switch on the first routine visit of the attendant, and the gear, with its interlocks, offers a simple but safe method of giving a slip-ring motor the same ease of operation as that of a squirrel-cage motor. Fig. 5 shows a motor with one of these liquid starters, and it will be noticed that it is placed near the motor, although the control switching apparatus is located in the control gallery. An effort has thus been made to reap the same advantages in the electric drive as are employed in the case of the one-man control of a steam drive, and as a result the motor-control system of the mills is such that the whole mill plant can be started from rest in two minutes by two attendants, and can be shut down by the pressing of four button switches. Each motor can also be stopped individually by means of similar switches, placed in the mill rooms near the machinery driven, to give safety in cases of emergency. This collective system of control ensures regular times of starting and stopping, an uncommon occurrence in mills with separately-controlled motors. The motor-starting switchboard was made by Messrs. Erskine, Heap & Co., Ltd. Fig. 9 is a view of the motor switch gallery showing the auto-transformer starters on the left.

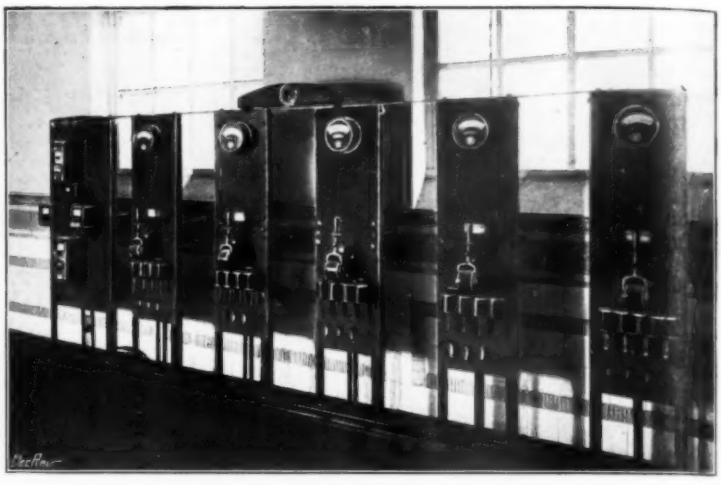


Fig. 4.—H.P. Switch Remote Control Panels.

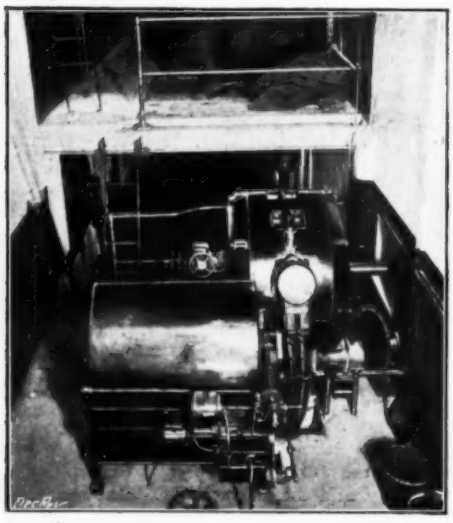


Fig. 5.—S.R. Induction Motor and Automatic Liquid Starter.

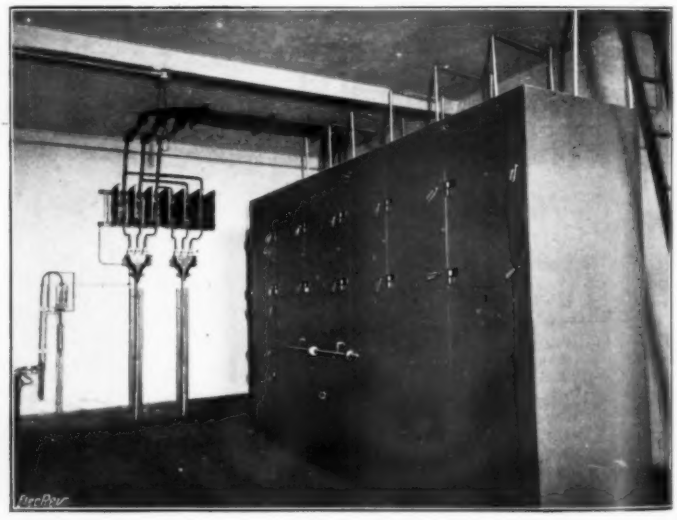


Fig. 6.—H.P. Oil-switch Cubicles.

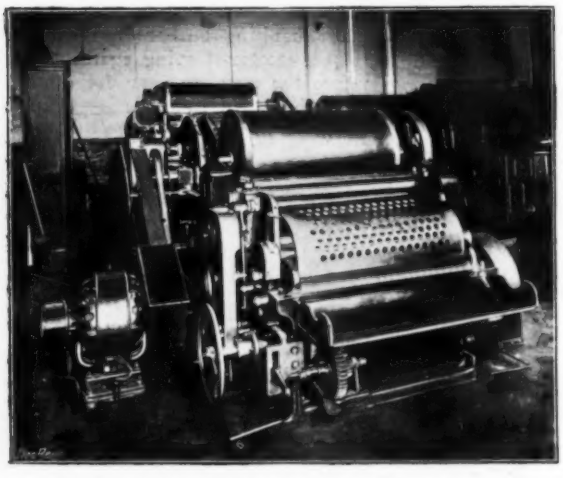


Fig. 7.—A Cotton Opener driven by Squirrel-cage Motor.

The majority of the induction motors, together with one 325-h.p. synchronous induction motor, were made by the Lancashire Dynamo & Motor Co., Ltd., and are chiefly of their "Maxtorq" type. Fig. 7 shows a scutching machine driven by one of the Lancashire Dynamo & Motor Co.'s "Maxtorq" motors. These motors, in virtue of the design of the rotor, are particularly suitable for long running under heavy-load conditions. The rotor is constructed with massive bars forming a positive lock against lateral movement, and the ends of the bars are brazed together so that there is no fear of metal running when the motors are hot; we have, in fact, seen one of these motors actually running with the ends of the bars red hot and functioning perfectly. The slots and bars are so designed that, when starting, the rotor current is banked up to the edge of the bars, thus increasing the effective resistance of the rotor; hence these motors can be started by switching direct to the supply mains under load conditions without any deleterious effects either to

the motors or the mains. Fig. 13, p. 462, a view of a "Maxtorq" rotor, gives an idea of the construction and size of the rotor bars and end rings, and the mode of jointing them. The starting characteristics thus obtained should go a long way in overcoming the objections raised by supply authorities to the use of squirrel-cage motors. The earlier motors were installed by the British Thomson-Houston Co., Ltd., and the English Electric Co. (Siemens).

Experience in different types of drives has enabled the management of the mills to approach something of the ideal in the driving arrangements of the later sections of the machines. The bale breaker, openers, scutchers, hoists, ventilating fans, pumps, mechanics' shop, and roller-covering room are separately driven with local switch and starting control; 25 motors, totalling 156 h.p., are used for these positions. Two of the card shafts have gear reductions between the motor and the shaft, and a third has a 360-h.p. motor direct coupled to the line shaft, and gives a very satisfactory drive. Figs. 10 and 11 show some of the Lancashire Dynamo and Motor Co.'s motors suspended from the ceiling, driving shafting in the new card room.

One of the spinning rooms containing fifteen pairs of mules is driven by a Lancashire Dynamo and Motor Co.'s 325-h.p. self-starting synchronous induction motor. The motor is direct coupled to the line shaft, and together with its belt driven exciter is shown in fig. 12. When starting, it operates as a slip-ring induction motor, and when up to speed and excited, as a synchronous motor with a leading power factor.

The power factor of the whole installation is raised by this means, and the reduction in the supply charges resulting is such as to redeem the extra capital expenditure on the machine, beyond that required for a motor of the ordinary type, within four years.

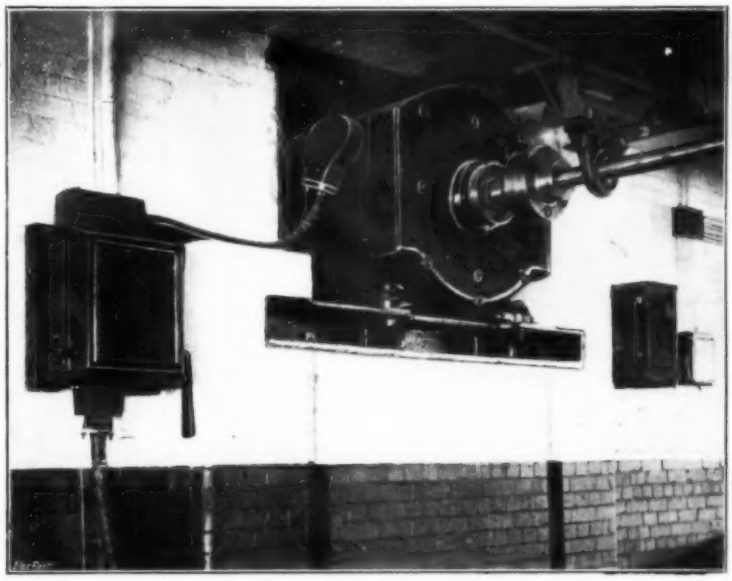


Fig. 8.—A 175-h.p. Squirrel-cage Motor Driving Shafting through a Solid Coupling.

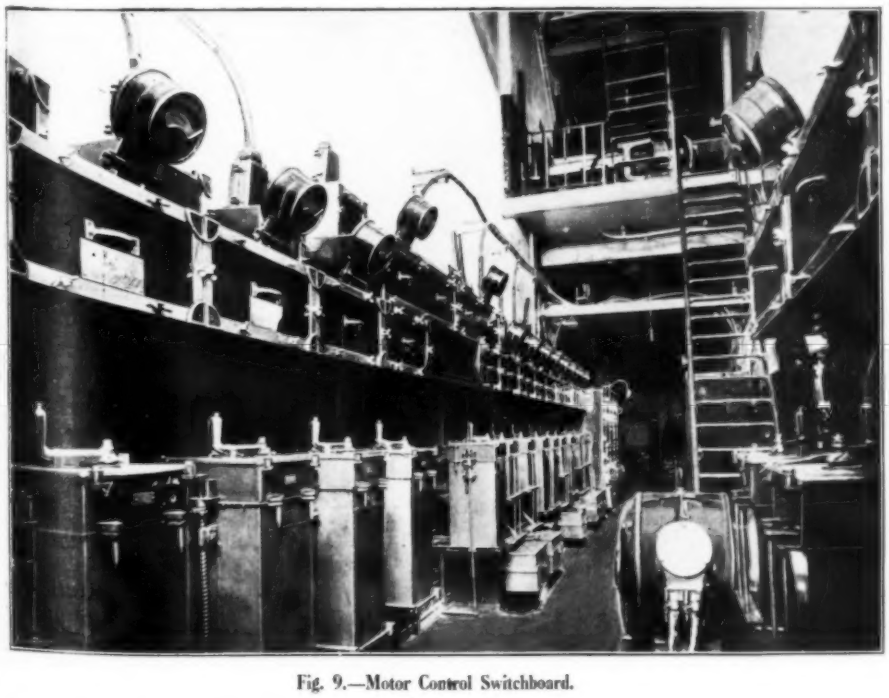


Fig. 9.—Motor Control Switchboard.

To overcome the difficulty sometimes experienced in fine spinning mills due to the humidity being disturbed by the heat dissipated by the motors, plans are in hand for connecting the motor openings to the ventilating and humidifying system of the mills. This is an improvement on the usual method of using pipe exhausts from the motors to the outer air, resulting in a waste of heat or bringing in fog and smoke, together with cool air, from the outside.

Over 3,400 h.p. of motors is installed in the mills, consisting of one 50-h.p., seven 60-h.p., two 75-h.p., one 90-h.p., two 100-h.p., one 110-h.p., four 120-h.p., one 140-h.p., and two 175-h.p. squirrel-cage motors; one 175-h.p., and two 375-h.p. slip-ring motors; and one 325-h.p. synchronous induction motor, as well as many smaller motors.

An extension from the banking busbar feeds the lighting switchboard, which distributes at 400 V to several single-phase, 400/100-V transformers in the mills. The lighting pressure is low because of the vibration of the mule spinning machinery, which affects the life of the filaments of lamps burning at the higher pressures to a greater extent than it does that of low-pressure filaments. Fig. 8 shows one of the L.D. and M. Co.'s 175-h.p., squirrel-cage motors driving spinning mules through a solid coupling.

Credit is due to the architects, Messrs. Potts, Hennings & Topping, of Bolton, for the planning of the premises in a manner conducive to the successful completion of the consulting engineers' schemes.

We are indebted to the proprietors, Messrs. Cannon Bros., Ltd., for permission to publish this article; and to the consulting engineers, Messrs. Kelly and Browning, who were responsible for the planning and execution of the whole of the electrical installation, for their courteous assistance in its preparation.

Power-house Pets—and Pests.

By "STAN DARD."

We have long been accustomed to accounts of the unfriendly behaviour of rats, their attentions generally taking the form of "shorting" h.p. gear. On such an occasion you will find that the humble and insignificant rodent, by plunging a town into darkness, attains unto

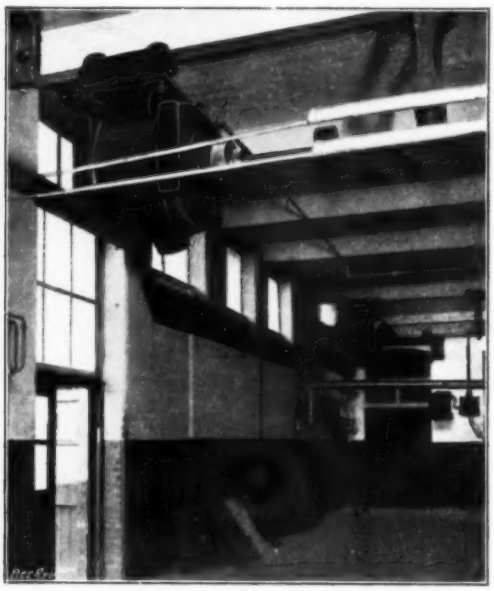


Fig. 10.—S.C. Motors (75 and 60-h.p.) Driving Combers and Frames (see p. 461).

a notoriety that many a human would envy. That simple act may have tremendous consequences. A power-station staff will be roused to an unusual state of

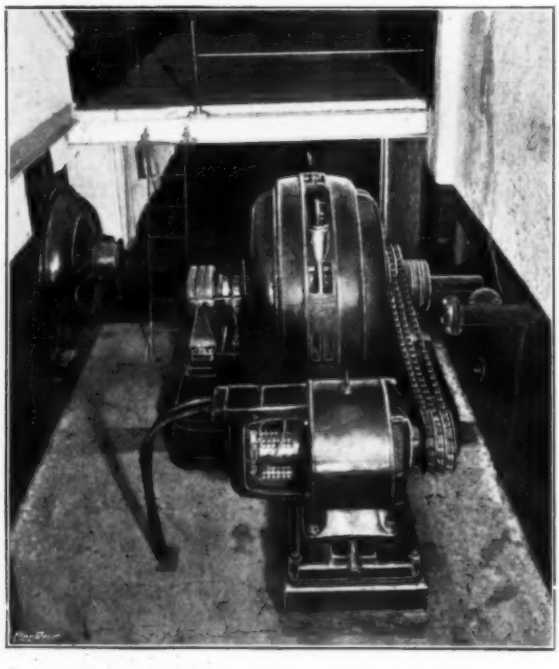


Fig. 12.—The 325-h.p. Synchronous Motor and Exciter.

energy and excitement; the boiler-house roof nearly goes up as the load vanishes; the chief, who has just arrived home and is feeling particularly appreciative of the aroma of dinner, receives a disturbing S.O.S.; kinema managers foam at the mouth; innumerable households are embarrassed, and umpteen valve sets switched on; and the Town Council at its next meeting

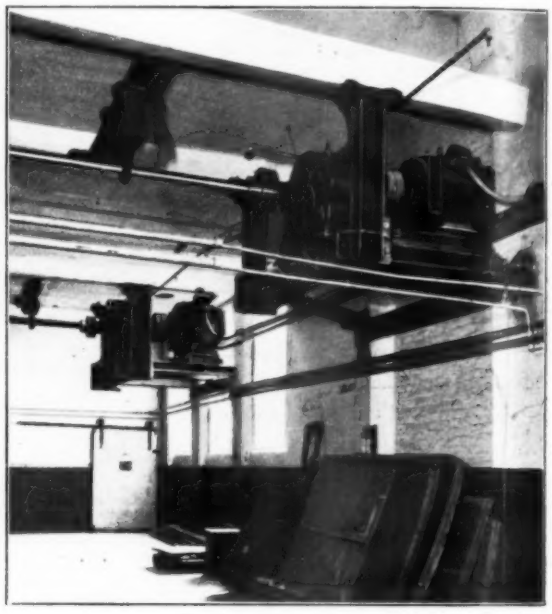


Fig. 11.—S.C. Motors (140 and 60-h.p.) Driving Card Lines through Reduction Gearing.

drops an unexampled number of aitches and hints. All because of a rat!

And so one can easily understand how the rodent species (which never seems to have been popular at any time) has by its unfortunate efforts in the technical field quite alienated any sympathisers. This does seem hard lines. After all, the animal cannot help being inquisitive (surely the greatest asset in research work), and certain makers of protective gear ought to be

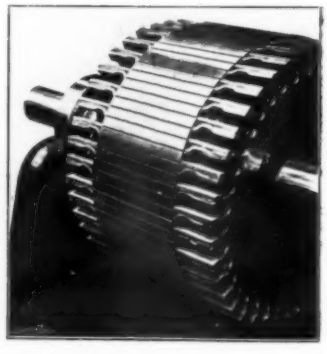


Fig. 13.—L.D.M. Co.'s "Maxtorq" Type S.C. Rotor.

especially grateful for the resultant demonstration and advertisement—I mean those makers of apparatus which *does* clear. However, I'm afraid that the rat is now definitely classified as anti-social and no friend of the electrical industry.

No one is more convinced of this than a shift engineer I know. One morning, in the wee small hours when even the only turbo that was running seemed to doze, this gentleman prepared an appetising repast

on the electric oven. Switching off the latter, he made a rapid tour of the station before returning to his meal (which by then, as you may imagine, had attained a most desirable flavour). Alas! the "shift" had paid the price of duty. During his absence a small colony of rats having, one would assume, made an unsuccessful tour of all the live gear, had entered his den and done full justice to the repast. One daring fellow was even courting untold pains in its innards by surreptitious sips from our friend's mug of "tea."

I shall not dwell upon the sensations which this discovery produced in the shift engineer's bosom. His technical education had been thorough, but during the next five minutes he surpassed himself. The inductive effect was felt throughout the power station. The turbo seemed to awake; up went the boiler-house gauges; the commissionaire in his cabin stirred uneasily and jingled his medals; and the switchman, pulling himself together, brought the system pressure up. When the next night-shift came round a cat joined the station staff.

Now, this brings me to the extraordinary part played by cats. You do not find the mere dog occupying any *rôle* at all in the electrical industry. A cat can make itself perfectly at home in a power house. Not so the dog. Why, the cat even makes a *post mortem* appearance upon the lecture table. Surely you remember that lecturer—the unpractical optimist you bitterly criticise in later years—making great play with the catskin in the electrostatic experiments?

While many cats have, without doubt, been introduced to the industry for the low, selfish and revengeful motives of the aforesaid shift engineer, I am only too well aware of many instances showing not only the disinterestedness of cats, but also their friendliness. I remember a young cat which strolled into a power-station during an acceptance test. So far as could be seen, it did so for no other reason than the loftiest motives of interest in the system of feed heating and the 450-lb. per sq. in. steam pressure. Having inspected the turbo-alternator, it looked in at the boiler house, where, by pure accident, it knocked over a *stoker's bottle of milk*. The cat, with innate good breeding, cleaned up the mess so far as digestion permitted. It then returned to the engine room, and there, with the utmost self-possession, it slept for three hours on one of the steps leading to the condenser basement.

And I know of a cat which has settled down at an electric furnace. When the latter is in use it sits in the vicinity and watches all the operations; having seen the molten metal drawn, it retires to a nook between the ironclad electrodes. But the most astonishing cat I've met is one I was introduced to in an engine room down a pit. Here a big induction motor running at 480 revs. per minute drives a pump. One day the motor was started up, but after a few minutes was shut down for certain adjustments. To the pumpman's amazement the cat tottered out of the rotor and was violently sick, remaining unwell for two days. Apparently the cat had taken a fancy to the warm interior of the open-type rotor and had been caught napping. Although it refuses to desert the pump-house in favour of the stables, nothing will now tempt it into the rotor!

It would not be true to say that I have never been acquainted with a cat that was animated by anti-electrical prejudice. I have, and that cat once featured in these very columns. The said cat (like us) resided in lodgings, and although not a paying guest, it appeared to be much nearer the landlady's heart than ourselves. Well, one day we accidentally made a remarkable discovery: the cat always hurriedly retired from the room whenever anybody picked up the ELECTRICAL REVIEW and read it. The problem puzzled us for a long time, but eventually we discovered that the cat's antipathy was merely due to the fact that whenever disciplinary action was taken by the landlady, this respected (and weighty) journal became a coercive instrument. I think you will agree that under the circumstances this one doubtful member of the feline community can be excused.

Contracts Open and Closed

(Concluded from page 458.)

Open.

Edinburgh.—April 10th. Electricity Supply Department. Steam, feed, and circulating pipework, with valves. (See this issue.)

Faversham.—March 25th. Electricity Department. Aerial, twin and 3-core cable. (March 13th.)

Greece.—April 15th. Greek Government. Manual telephone exchange for the city of Athens.*

Hornsey.—March 26th. Electricity Department. One cooling tower. (March 6th.)

Ilford.—March 24th. Electricity Department. E.h.p. switchgear and ten 25-kVA transformers. (March 6th.)

India.—April 7th. India Store Department. Telephone repeaters. (See this issue.)

Knottingley.—March 23rd. Wiring Town Hall for electric lighting. Particulars from Mr. Jas. Belford, surveyor to Urban District Council, Town Hall.

London.—METROPOLITAN ASYLUMS BOARD.—March 25th. Three electric passenger lifts for the Tooting Bec Hospital. (March 13th.)

March 25th. Extensions to the electric lighting installation at the North-Western Ambulance Station, Lawn Road, N.W. (March 6th.)

March 31st. General engineering work, including centralised heating and h.w.s. systems, steam mains, &c., laundry and kitchen equipment, installation of electric lifts, installation of baker's oven, installation of electric lighting, auto fire alarms, electric clocks, &c., at the Grove Park Institution, Lee, S.E.12. (March 13th.)

ISLINGTON.—March 27th. Two electric refuse-collecting vehicles, with steel tipping bodies and four horse-drawn street-watering vans. (March 13th.)

BETHNAL GREEN.—March 27th. Electricity Department. Twelve months' supply of l.p. cables and 3-phase meters. (March 13th.)

BATTERSEA.—April 1st. Electricity Department. Two 750-kW converters, e.h.p. and l.p., a.c. and d.c. switchgear, three 250-kVA static transformers. (See this issue.)

Manchester.—March 26th. Electricity Committee. Inductor regulators and 130 soot blowers. (March 13th.)

April 2nd. Wiring of lighting and heating circuits in the stores and house, High Street Depôt, Chorlton-on-Medlock. (See this issue.)

New Zealand.—AUCKLAND.—May 25th. Auckland Electric Power Board. One 14-ton electrically-operated overhead travelling crane.*

WELLINGTON.—April 28th. Government Railway Department. A.c. electric motors.*

South Africa.—JOHANNESBURG.—May 4th. Chief Storekeeper. Electric welding machine and converting apparatus for welding appliances.*

Municipal Council. March 26th. 1,080-kVA single-phase transformers. April 18th. Insulating tapes, primary fuses and joint-box compound. April 9th. Switchgear and transformers.*

Spain.—SEVILLE.—The Junta de Obras del Puerto de Sevilla y Rio del Guadalquivir. Eight electric cranes.—*Reuter's Trade Service* (Madrid).

Switzerland.—March 23rd. General Direction of the Swiss Federal Railways, Berne. Three 100-ton overhead travelling cranes. Particulars (9 fr.) from the Abtheilung für Elektrification, Zimmer No. 166, Dienst Gebaude, 43, Mittelstrasse, Berne.

Walthamstow.—April 8th. Electricity Department. One 7,000-kW turbo-alternator and condensing plant, one 1,000-kW motor converter, l.p. cables, and v.i.r. wires. (See this issue.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Basingstoke.—Electricity Committee. Recommended:—
Generator panel and feeder panel (£211).—Park Royal Engineering Co., Ltd.

Bedford.—Corporation. Accepted:—
Chlorinating plant (£320).—Paterson Engineering Co.
Boiler isolating and drain valves (£38).—Dewrance & Co.
Steam feed range valves (£318).—Hopkinson & Co.
Coal-handling plant (£1,036).—Bagshaw & Co.

Carlisle.—Electricity Committee. Accepted:—
Two electrically-driven circulating water pumps, with motor and control gear (£2,081).—Worthington-Simpson, Ltd.

China.—Hankow.—The following are the particulars of tenders submitted for transformers, switchgear, &c., for the Hankow Waterworks and Electric Light Co., Ltd. The contract, as announced in the Electrical Review for January 16th, 1925, p. 105, has been placed with Messrs. Arnhold and Co., Ltd. :—

Arnhold & Co., Ltd. (for Metropolitan-Vickers Electrical Co., Ltd.)	£16,596
Inniss & Riddle (for British Thomson-Houston Co., Ltd.)	16,396
British Electrical & Engineering Co.	15,665
Jardine Eng. Corp. (for Johnson & Phillips)	15,917
Shewan, Tomes (for ditto)	15,919
G.E.C. of China	17,300
Representation for Br. Mfrs. (for Ferranti, Ltd.) (no busbars)	15,294
Andersen, Meyer (for G.E.)	G$106,000
Alternatively	93,260
Additions	1,600
Garry & Cunningham (for Westinghouse)	105,892
Alternatively	89,406
Takata (for Westinghouse)	66,600
Siemens China Co.	43,685
Siemssen (for A.E.G.)	66,468
Moysey (for Swedish G.E.)	£19,580
M. B. S. K. (Japanese)	Y159,280
M. B. K. (for Sibaura transformers and B.T.-H. switchgear)	Y74,590, £8,258 or Y74,590, £8,577
Holland China Trading Co.	£12,180
Transformers Only.	
John Richards (for Ferranti, Ltd.)	£9,465
China Electric (for Moloney)	G$41,989
L. E. Gale (for Allis-Chalmers)	G$45,833
Longovica (French)	£9,821

Kettering.—Electric Lighting Committee. Accepted:—
E.h.p. and l.p. lead-covered armoured cable (£5,863).—Union Cable Co., Ltd.

London.—The General Electric Co., Ltd., has received contracts from the Admiralty for the supply of 11,450 Osram flashlight lamps and 16,400 Robertson tubular lamps; also a six-months' contract for Osram gasfilled and Robertson carbon-filament lamps from the Southern Railway Co. and from the London, Midland & Scottish Railway a contract for 2,000 train-lighting lamps.

Willesden.—
Preheaters for the North Metropolitan Electric Power Supply Co.'s stations at Willesden and Brimsdown.—Howden-Ljungström Air Preheaters (Land), Ltd.

Portsmouth.—Tramways Committee. Recommended:—
240 side destination indicators for the tramcars (£570).—Messrs. Gabrielle.

Corporation. Recommended :—
Supply of cable, 1,500 yd. .1 sq. in. (£514); 1,500 yd. .05 sq. in. (£426); 1,200 yd. .12 sq. in. (£398); 2,000 yd. .12 sq. in. (£524); 3,000 yd. .0145 sq. in. (£447).—Johnson & Phillips, Ltd.
Two electrically-driven centrifugal pumps, &c., in connection with the Southsea storm-water drainage scheme (£1,200).—Worthington Simpson, Ltd. (Recommended.)

Margate.—Town Council.
Wiring work in connection with an electric lighting installation at the Wingham water works pumping station (£225).—Henry S. Tett and Co., Ltd. (Accepted.)

Stafford.—Electricity Committee. Accepted:—
40,000-lb boiler (£10,439).—Stirling Boiler Co., Ltd.

South Africa.—Bloemfontein.—Town Council. Accepted: —In connection with the erection of the new power station, the Town Council has accepted the following tenders :—
Overhead crane (£898).—Blane & Co.
Boilers (£45,560).—Dowson & Dobson (agents for Vickers-Spearing Boiler Co., Ltd. See Elec. Rev., February 6th, p. 222).
Generating sets (£25,510).—Allen, Sons & Co.
Cooling tower, filling (£2,376).—Dowson & Dobson.
Switchgear (£2,670).—Wilson & Herd.
Coal- and ash-handling plant (£8,564).—Hubert Davies & Co.
Pipework (£14,292).—Dowson & Dobson.
Power and lighting wire (£1,625).—Reunert & Lenz.
Total contracts, £111,492.

Johannesburg.—Municipal Council. Accepted :—
Tramcar motors and spares (£7,900) (No. 388).—Metropolitan-Vickers Electrical Co., Ltd.
100 special meter boxes (£212) (No. 398).—Siemens (S.A.), Ltd.
Electric cable contract (No. 389).—Telegraph Mfg. Co. (Col.), Ltd. (£19,976); W. T. Henley's (S.A.) Telegraph Works Co., Ltd. (£3,735); J. C. Ferguson (£104). (Contract No. 402), Telegraph Mfg. Co. (Col.), Ltd. (£2,692).

Durban.—Municipal Council. Accepted :—
Nine e.h.p. sub-station switch cubicles (£1,200); six ditto (£676).—T. Barlow & Sons, Ltd.
Five e.h.p. sub-station cubicles (£649).—Bartle & Co., Ltd.
25 miles No. 10 s.w.g. triple-braided wire ((£635); 10 miles No. 7/16 s.w.g. ditto (£333).—W. T. Henley's (S.A.) Telegraph Works Co., Ltd.
Ten 100-kVA transformers (£780); three e.h.p. switch cubicles (£482).—Metropolitan-Vickers Electrical Co., Ltd.
E.h.p., h.p. switchgear (£2,705); e.h.p., h.p., and l.p. switchgear (£1,984). A. Reyrolle & Co. Ltd. —*S.A. POWER ENGINEER.*

Swansea.—Electricity Committee. Recommended:—
Reconstruction of alternator (£3,500).—C. A. Parsons & Co., Ltd.

Watford.—Town Council. Accepted:—
Installing electric light at the offices and Council Chamber (£118).—West Herts. Electric Co.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of :—

Rubins armature coil winder.
Sealing wax heaters (small, suitable for 50-volt supply).

Forthcoming Events.

Electrical Power Engineers' Association (London Western Section).—Saturday, March 21st. At the Coventry Restaurant, W.1. At 6.30 p.m. Annual dinner.

Institution of Electrical Engineers.—Informal Meeting.—Monday, March 23rd. At the Institution, Victoria Embankment, W.C. At 7 p.m. Discussion on "Panel Heating," to be opened by Mr. R. Grierson.

(North-Eastern Centre).—Monday, March 23rd. At the Mining Institute, Newcastle-on-Tyne. At 7.15 p.m. Paper on "The Post Office and Automatic Telephones." by Col. T. F. Purves.

(North-Midland Centre).—Tuesday, March 24th. At the Hotel Metropole, Leeds. At 7 p.m. Paper on "The Design of Electrical Plant, Control Gear, and Connections for Protection Against Shock, Fire, and Faults," by Mr. H. W. Clothier.

(East-Midland Sub-Centre).—Tuesday, March 24th. At the University College, Nottingham. At 6.45 p.m. Paper on "Electricity in Mines," by Major E. L. David.

(Students' Section, North-Western Centre).—Tuesday, March 24th. At the Milton Hall, Deansgate, Manchester. At 7.30 p.m. Annual general meeting. Paper on "The National Problem of Economic Power Supply," by Mr. L. J. H. Taylor.

Industrial League and Council.—Tuesday, March 24th. At the Regent Street Polytechnic. At 6.30 p.m. Lecture on "Payment and Incentives in Industry," by Miss C. Haslett.

Electric Lamp Manufacturers' Association of Great Britain, Ltd. (North-East Coast Area).—Wednesday and Thursday, March 25th and 26th. At the Church Institute, Hood Street, Newcastle-on-Tyne. At 7 p.m. Popular demonstration lectures on "Modern Electric Lighting," by Mr. W. E. Bush.

Institution of Civil Engineers.—Wednesday, March 25th. At the Institution, Great George Street, S.W. At 6 p.m. Joint meeting with bodies which are co-operating in the work of the "Special Committee on Tabulating the Results of Heat Engine Trials," to discuss "A Standard Code for Tabulating the Results of a Steam-Generating Plant Trial."

Tuesday, March 24th. At 6 p.m. Paper on "The Large Water-tube Boiler," by Mr. P. W. Robson.

Association of Consulting Engineers (Incorp.).—Thursday, March 26th. At St. Stephen's Club, Victoria Embankment, S.W. At 7 for 7.30 p.m. Annual dinner.

Royal Institution of Great Britain.—Thursday, March 26th. At 21, Albemarle Street, W. At 5.15 p.m. Lecture on "The Chemical and Physical Effects of Light," by Mr. T. Thorne Baker.

Friday, March 27th. Lecture on "Studies of Atomic Nuclei," by Sir Ernest Rutherford, F.R.S.

Birmingham Electric Club.—Friday, March 27th. At the Grand Hotel, Birmingham. At 7 p.m. Lecture on "Research in the Cable Industry," by Mr. P. Dunsheath.

Edinburgh Electrical Society.—Friday, March 27th. At the Philosophical Institution, 4, Queen Street. At 8 p.m. Paper on "Electrical Development," by Mr. R. Hardie.

Junior Institution of Engineers.—Friday, March 27th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette on "Irrigation Engineering in Burma," by Mr. A. P. Morris.

Borough Polytechnic Institute.—Saturday, March 28th. At Borough Road, S.E. From 3 to 9.30 p.m. Annual Exhibition of Students' Work.

Notes.

Microphones in the Lords.—The Select Committee on House of Lords Offices has appointed a sub-committee to consider a proposal which had been made to place in convenient positions in the House acoustic instruments for the use of peers who may have difficulty in hearing the proceedings. The sub-committee will consider whether it would be possible to install microphones on the table of the House and connect them with certain of the benches, where earpieces would be available for the use of those who are hard of hearing.

Fireproof Insulation.—Fireproof insulation for telephone switchboard wires is made possible with the aid of selenium, an element whose chief use hitherto has been in apparatus involving the control of electric current by light. The flame-proofing of switchboard wires is highly important, for even a small fire can undo many hours of work and throw a whole exchange out of commission. Fireproofing substances now in use are only partially successful, says *Science*, and the peculiar thing about the use of selenium for this purpose is that the element itself can be burned. Only when it is used on the cotton covering of the wires does it take on fireproof qualities, but then the wire resists all ordinary flames, and even when ignited by the intense heat of a blow-torch goes out immediately when the outside flame is removed.

Ex-British Westinghouse Dinner.—The seventh annual reunion of the Ex-British Westinghouse Association was held at the Holborn Restaurant, London, on Friday, March 13th, and was a great success. The chair was taken by Mr. James Turnbull, a member of the "Holy Forty," and 130 ex-B.W. men attended from all parts of the country. As is usual, the gathering was a reunion in every sense of the word, and the evening was thoroughly enjoyed by all present. The tables were arranged to seat small groups, and were labelled after familiar spots at the Wembley Exhibition. The toasts, after the loyal toast, were simple and to the point: "The Ex-B.W. Association," presented by the Chairman; the "Silent Toast"; "The Chairman," proposed by "Holy Forty" Whitmoyer; and "Absent Friends," by Mr. J. H. Teatle. The ballot for life membership of the Association was won by Mr. W. E. Bouette. The ex-B.W. choristers, in mortar boards and surplices, again successfully rendered the opening chorale and the usual anthem before and after dinner, respectively. A hearty vote of thanks was given to the Committee and the hon. secretary, Mr. L. S. Richardson, who agreed to act for a further year with Mr. W. E. Warrilow as assistant secretary and treasurer. We understand that a few copies of the official programme are available, and we are asked to remind members who have not paid their subscriptions to send 2s. 6d. to Mr. Richardson, at 18, Hillside Road, Bushey, Herts.

Fire.—A recent fire at the Camperdown Quarry, Lochee, Dundee, destroyed the engine room, which contained a dynamo and other machinery.

A One-Million-Volt Arc.—An event of historical interest in the progress of electrical engineering in this country took place on March 10th at the works of Messrs. Ferranti, Limited, Hollinwood, Lancashire; for the first time in Great Britain a pressure of one million volts (r.m.s.) above earth, was obtained. The accompanying illustration shows the last of the three pressure transformers connected in cascade under the Dessauer patent, of which Messrs. Ferranti are the sole licensees for the greater part of the British Empire. The primary of the first transformer was supplied at 6,600 volts, 60 periods, and gave 333,000 volts on its secondary. The second transformer, just visible on the extreme left, was insulated from earth and one end of its primary winding was connected to the 333,000-volt terminal of the first transformer and the other end to a 321,000-volt tapping. In this way the secondary winding of the second transformer raised the pressure to 666,000 volts above earth. Similarly, the third transformer, seen in the centre of the picture, was insulated from earth and supplied from the second transformer, and the pressure was thus raised to one million volts above earth. All

One-Million-Volt Arc at Hollinwood.

these figures are r.m.s. values and the actual peak value of the pressure across the 9 ft. 6 in. arc which resulted was 1,400,000 volts. A sustained arc was obtained between points and the value of the pressure was calculated from the voltage ratios of the transformers and checked by the length of the spark gap, which was adjusted according to the humidity of the atmosphere at the time (Mr. F. W. Peek, A.I.E.E. *Journal*, June, 1923.) The connection to earth of the point seen on the right of the picture took the form of a limiting resistance. Some curious effects were observed. An arc is visible in the illustration underneath the third transformer, in the centre of the picture. This is due to the transformer not being far enough from the side of the testing pit; an arc jumped from the metal sheet on which the transformer stood to the pit side. The glow behind this transformer resulted from a short circuit which occurred in a lampholder, fixed on a pillar of the building, through high pressure being induced in the wiring. During the last few years, Messrs. Ferranti have made many testing transformers, including one to give 500,000 volts above earth in a single unit.

Sydney Electricity Supply.—Following upon its decision to disregard the recommendations made by Mr. S. L. Pearce, C.B.E., in his report upon the city's electricity undertaking, the Sydney (N.S.W.) City Council has definitely decided to give the requisite 5-years' notice of its intention to terminate the bulk-supply agreement with the Railway Commissioners. It has also decided to proceed with the choosing of a site for the erection of a new power station, and the invitation of tenders for its construction. Furthermore, the general manager of the undertaking has been instructed that "neither he nor any member of his staff in the service of the Council is in any way, directly or indirectly, to aid the Government in its scheme for bringing into existence an Electricity Commission. In moving the resolution embodying these decisions, the Lord Mayor said, according to the *Sydney Morning Herald*, that the New South Wales Government was endeavouring to set up a similar body to the Electricity Commission of Victoria, in spite of the "dismal failure" of that body. He considered that the carefully built-up undertaking in Sydney would be very adversely affected by such a policy. The agreement with the Railway Commissioners should never have been executed.

The Proposed Mersey Tunnel.—The Government has agreed to increase its contribution towards the cost of the projected tunnel under the Mersey to £2,500,000, which is half of the estimated cost. The Government has also sanctioned the extension of the toll period from fifteen to twenty years; this represents a gain of about £180,000.

Appointments Vacant.—Head of the Electrical Engineering Department of the Northampton Polytechnic Institute (£700). Sub-station attendant (65s.) for the Torquay Corporation Electricity Department. Power station engineer (£600+ =£801) for the Greenwich Power Station, L.C.C. Tramways. Meter repairer for the Stepney Borough Council Electricity Department. Assistant to constructional engineer (£430), draughtsman (£342), for the Birmingham Corporation Electricity Department. Shift engineer for the Accrington Corporation Electricity Department. Combustion engineer for the Barking power station. Civil Service Commission, forthcoming examinations for male assistant superintendent of traffic (Class II) in the London Telephone Service, and male assistant traffic superintendent in the provinces, G.P.O. (18-23). Regulations and particulars can be obtained from the Secretary, Civil Service Commission, Burlington Gardens, W., together with the form on which application must be made. Latest date for application, April 16th. Fourth engineer-in-charge and assistant mains engineer for the Hammersmith Borough Council Electricity Works. (See our advertisement pages to-day.)

The Electrical Trades Benevolent Institution.—The annual general meeting of this Institution will be held at the Institution of Electrical Engineers on Monday, March 30th, at 3 p.m.

Local Societies.—ELECTRIC FURNACES.—A paper on this subject was read recently by Mr. A. G. Lobley, M.Sc., Reader in Electrochemistry at Manchester University, to the members of the Scottish Section of the Institute of Metals, in Glasgow. Having compared the efficiencies of various heating processes, Mr. Lobley reviewed the principles and characteristics of the main types of electric furnaces used for non-ferrous metal melting and for heat treatment in general. It was in those directions that the possibilities of the electric furnace in this country were greatest, although it was at present the least explored field. He also gave special attention to the metallic resister type of furnace for temperatures under 1,000 deg. C., and maintained that, apart from the very important advantages of yielding a better and more uniform quality of the product, flexibility in use, &c., in many applications, it not only did not cost more to run an electric furnace than the older types, but often less. In America, he said, the industrial electric heating load now exceeded 1¼ million kW.

An Exhibition of Inventions.—The Institute of Patentees (Inc.) is arranging an exhibition of the inventions of its members to take place at the Central Hall, Westminster, from June 8th to 13th. Entrants to this exhibition will have the right to display their devices at Wembley this year.

Tramways and Omnibus Competition.—The Council of the Municipal Tramways Association decided at a meeting held on March 13th to call a conference of representatives of all the municipal tramway undertakings in the country on March 26th to consider the question of motor-omnibus competition. The matters which will be discussed include the action of the Ministry of Transport in refusing to allow local authorities to withhold licences from competing motor omnibus concerns, and in endeavouring to induce these authorities to grant licences for privately-owned omnibuses.

Aircraft "Leader" Cable.—During the recent debate in the House of Commons on the Air Ministry estimates, Sir P. Sassoon, Under-Secretary for Air, described a method of ensuring the safety of aeroplanes landing at night or in fog by means of an electric "leader" cable, charged with a.c., laid right round the aerodrome landing ground. New methods of illuminating an aerodrome provide an illuminated surface up to 800 ft. in height in a fog. Once a machine gets within this area it is within the guiding range of the cable, and thus the pilot can discover if he is within the circuit of the aerodrome. Having done so, he can drop till he actually sees the lights of the aerodrome and so make a safe landing.

A Ratepayers' Lecture.—A meeting of some importance from the view of the necessity for educating the public in electrical matters, was held at Stoke Newington on March 6th, when Councillor Wilson, chairman of the Borough Electricity Committee, lectured to the local Ratepayers' and Electors' Association upon the Council's electricity undertaking. He said that from the outset it was realised that it would be more economical to purchase a bulk supply of electricity and distribute it rather than to erect a generating station in the borough. A temporary supply was obtained from Hackney, and, later, a more permanent arrangement was entered into with the North Metropolitan Electric Power Supply Co. Under this agreement the company bore any losses which were incurred and took any profits which were made, so that no charge fell upon the ratepayers. At a later date the Corporation took over the full responsibility, and the undertaking had continued successfully. The present works was erected in 1906 and apart from a small refuse destructor plant, the whole of the supply was purchased from the North Metropolitan Co., the agreement with which would terminate in 1928. As an indication of the progress which had been made Councillor Wilson stated that the amount of energy sold had increased from 589,000 kWh in 1914 to over 2 million kWh in 1924; the number of consumers had risen from 528 to 2,060. The capital expended totalled £108,515, of which £88,307 had been raised by loan; £25,312 had been repaid and there was a reserve of £10,820. The undertaking had contributed £4,000 to rate relief.

Institution Notes.

Institution of Electrical Engineers.—Informal Meeting.—At the informal meeting on Monday, March 9th, Mr. W. E. Warrilow was in the chair when Mr. C. W. Sully, director and secretary, Electric Lamp Manufacturers' Association of Great Britain, Ltd., opened a discussion on "Illumination." Mr. Sully said that because everybody gets light free for many hours of the day, it is not valued sufficiently, and the attainment of adequate standards of artificial lighting progresses slowly against indifference. He divided his remarks under three heads: First, What is required; secondly, How to attain it; and thirdly, The best way to use it. He showed a number of lantern slides illustrating wasteful as well as appropriate ways of using illumination, and he urged that architects, who often design buildings to obtain daylight to the best advantage, should give corresponding consideration to the design and placing of artificial illumination.

Mr. J. Coxon, speaking of the disinclination of many people to adopt indirect lighting, suggested that it was often due to the convenience of being able to hold a piece of work up to scrutiny under concentrated light. There was also the psychological effect of having to work in a room where there were patches of light and comparatively depressing gloom around.

Messrs. W. E. Warrilow, J. R. Bedford, A. Collins, P. Dunsheath, W. A. Erlebach, A. F. Harmer, A. G. Hilling, A. B. Mann, W. E. Rogers, F. P. Sexton, and M. Whitgift also took part in the discussion.

The High-pressure Conference.—In connection with the International Conference on High-pressure Systems, of which particulars were given on p. 417 of our last issue, the Council of the Institution has set up a British National Committee representative of the sections of the industry concerned. Any member of the Institution may become a "free member" of the Conference by sending his name to the Secretary, Mr. P. F. Rowell, together with a remittance of £1 2s. 6d. The British official delegates will be Messrs. W. B. Woodhouse, A. R. Everest, P. V. Hunter, C.B.E., A. Page, and E. B. Wedmore; if additional delegates are required Messrs. P. Good, R. Borlase Matthews, and G. V. Twiss will be nominated.

Institution of Mechanical Engineers.—On Friday last two papers were read in connection with the work of the Cutting Tools Research Committee; one was a report on the action of cutting tools, by Prof. E. G. Coker, F.R.S., and the other an account of experiments with lathe tools on fine cuts and of the properties of the materials used, by Messrs. Dempster Smith, M.B.E., and A. Leigh.

Royal Institution.—On Thursday next (March 26th), at 5.15 p.m., Mr. T. Thorne Baker will deliver the first of two lectures on the Chemical and Physical Effects of Light: (1) Reproduction of Light Images by Photography; (2) Transmission of Light Images by Electricity. The Friday evening discourse on March 27th will be delivered by Sir Ernest Rutherford on "Studies of Atomic Nuclei."

Institute of Metals.—House Fund.—Prof. T. Turner has been re-elected president and Sir John Dewrance and Sir W. Smith vice-presidents. A house fund has been started with an initial donation of £1,000 from Mr. L. Sumner (past-president) with a view to providing the Institute with a building of its own.

Autumn Meeting.—The autumn meeting has been arranged to take place at Glasgow from September 1st to 4th.

Association of Mining Electrical Engineers.—The London Branch of the Association held a meeting at the works of Messrs. Allen West & Co., at Brighton, on Saturday, March 14th, a party of some 50 being taken round the works by Mr. Allen West and shown some very interesting controller gear for winding purposes. Subsequently the party was entertained at tea by the firm, and after the reading of a paper by Mr. Allen West on the subject of the design of controllers for electric winders and haulages, the visitors were taken to the Albion Hotel and entertained to dinner. It was announced that Mr. J. W. Gibson had been re-elected branch president for the 1925-26 session. The summer meeting of the Association is to be held at Cardiff from June 9th to 13th.

Our Personal Column.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Messrs. G. M. Clark & Partner have opened offices at 7, Victoria Street, S.W.1, where they will act as consulting engineers; Mr. G. J. Moore, M.C., D.S.O., M.I.Mech.E., M.I.E.E., will remain in South Africa at 40, Meischke's Buildings, Johannesburg, whilst Mr. W. Parker, M.Inst.C.E., will be in charge of the London Office. Mr. G. M. Clark, M.Inst.C.E., M.I.Mech.E., M.I.E.E., an old Cromptonian, was chief assistant to Sir A. B. W. Kennedy before becoming the electrical adviser to the Government of the Cape of Good Hope in 1899. After the South African war he completed the construction of the Johannesburg waterworks with Mr. Thomas Stewart, M.Inst.C.E., and took a large part in the system of compressed-air supply to the Rand Mines (60,000 kW); recently he constructed the new municipal power station (10,000 kW) for Pretoria.

The Douglas (I. of M.) Electricity Committee recommends increasing the salary of Mr. Bertram Kelly, the borough electrical engineer from £470 to £500 per annum.

Messrs. Ravenshaw & Dyer, consulting engineers, have removed this week from Golden Manor, Hanwell, to offices at Carbon Chambers, Hall Gate, Doncaster, which is their sole address.

The Doncaster Town Council has granted an honorarium of £150 to the borough electrical engineer, Mr. Windle, in recognition of special services in connection with the recent extensions to the electricity works.

Modern Transport states that Major R. F. Morkill, who has been appointed signal and telegraph superintendent to the Metropolitan Railway, has had considerable experience in electrical and signal engineering. After holding responsible positions with electrical engineering undertakings in Canada, Newfoundland, and South Africa, he was, in 1902, appointed to organise the signalling of the Central South African Railways. After engagements with American and Canadian signal companies he was appointed signal and electrical engineer of the Grand Trunk Railway. Later he was made general manager and director of La Société des Apponcils de Securité de Chemins de Fer, Paris, and was then appointed works manager of Tyer & Co., Ltd., signalling engineers, of Dalston.

The same contemporary states that, in order to deal more efficiently with the special problems of electric traction and the growing use of electricity in railway operation generally, the directors of the London, Midland & Scottish Railway have formed a separate electrical department in charge of Lieut.-Col. F. A. Cortez Leigh, which will control all classes of the railway's work connected with electricity, including telegraphs, telephones, lighting, wireless apparatus, track circuiting, and electrification. The Manchester-Oldham electrification scheme has already been handed over to the section. The directors of the L.M.S.R. have appointed Mr. J. Dalziel to be assistant electrical engineer, and Mr. J. Sayers to be telegraph superintendent, positions similar to those which they held with the former Midland Railway Co.

Mr. Thos. Roles, Bradford city electrical engineer, who, as already stated, had to undergo an operation following an attack of influenza, is progressing favourably at the Ilkley Hospital, and is expected to leave about the end of March.

Mr. W. T. Green, assistant manager to the Leeds Corporation Electricity Department, and formerly secretary of the Yorkshire House-to-House Electricity Co., is shortly retiring from the department after 36 years' service.

The Aylesbury Town Council has referred back for three months a recommendation that the salary of the electrical engineer, Mr. W. A. Turnbull, be increased from £560 to £660 per annum, plus an allowance of £52 a year in respect of a motor-car.

Mr. Thos. T. D. Geesin, A.I.E.C., until recently London representative to Messrs. Walter McGee & Son, Ltd., and Bull Motors, Ltd., has been appointed general manager of Walter McGee & Son, Ltd., of Paisley.

Mr. E. Yeoman-Robinson, whose thermionic valve inventions, we are informed, are being developed and marketed by the Metropolitan-Vickers Electrical Co., Ltd., was married at Withington on March 12th to Elsie May, daughter of Mr. Edward Wall, of Withington.

The Whitehaven Town Council has increased the salary of Mr. Hogarth, borough electrical engineer, by £50 per annum.

The Swansea Electricity Committee proposes to increase the salary of Mr. A. Rees to £690 (basic figure), and that of Mr. A. R. Hawthorne, junior charge engineer, to £340 (basic figure).

Mr. Samuel Insull was to arrive in this country from America during this week.

The Croydon Town Council has increased the salary of the borough electrical engineer, Mr. A. C. Cramb, from £1,200 to £1,400 per annum.

Mr. John Hieger is leaving the Electrical Inspection Department of Messrs. C. A. Vandervell & Co., Ltd., Acton, in order to take up an appointment with the A.E.G. in Berlin.

It is stated that 120 applications have been received for the post of city electrical engineer at Bath, vacated by Mr. F. Teague on retirement.

The Hammersmith Borough Council Establishment Committee, on the recommendation of the Electricity Committee, recommends an additional payment of £100 to Mr. R. H. Paterson, station superintendent, in consideration of extra duties and responsibilities during the past 12 months; also that he be promoted to the position of chief assistant electrical engineer at £750 per annum. Mr. C. F. Button, of Tonbridge, has been appointed fourth engineer-in-charge, at £349 per annum.

Obituary.—Major F. Coutts.—Major Fred. Coutts, general manager of the West Riding Electric Tramways, Ltd., Wakefield, died recently in a Sheffield nursing home, following an operation for appendicitis. In January he resigned the position of general manager of the Dearne District Light Railways on appointment to Wakefield, and his son, Mr. Ronald Coutts, succeeded him at Dearne Valley.

New Companies Registered.

Conradi & Braun, Ltd. (204,461).—Private company. Registered March 13th. Capital, £3,000 in £1 shares. To acquire the business of an importer and exporter of electrical accessories carried on by L. F. Braun at 52, Theobalds Road, W.C., and to carry on the same and the business of manufacturers of and dealers in electrical apparatus, wireless instruments, apparatus and accessories, &c. The first directors are:—L. F. Braun, 15, Porchester Gardens, W.2, dealer in wireless and electrical goods (permanent governing director and chairman); F. S. Conradi, 15, Porchester Gardens, W.2, wireless and electrical goods salesman. Qualification, 1 share. Remuneration as fixed by the company. Solicitors: D. A. Romain, 196, Bishopsgate, E.C. Registered office: 52, Theobalds Road, W.C.

Garty & Co., Ltd. (205,298).—Private company. Registered March 6th. Capital, £1,000 in £1 shares. To carry on the business of motor and electrical engineers formerly carried on by J. B. Garty at 16, Balham Hill, S.W. The first directors are:—J. B. Garty, 16, Balham Hill, S.W., engineer; A. A. Feltham, 107, Rodenhurst Road, Clapham, S.W., insurance underwriter. Qualification, £1. Remuneration of J. B. Garty, £208 per annum; of other directors, 50 guineas each per annum. Solicitor: A. W. Gross, 5, Chancery Lane, W.C.2. Registered office: 16, Balham Hill, S.W.

Magneto Repair Depôt and Motor Works (Christchurch), Ltd. (204,363).—Private company. Registered March 9th. Capital, £3,000 in £1 shares. To acquire the business of magneto and electrical apparatus repairers now carried on by J. Adamson, Junr., and T. W. Wood at Avon Wharf, Christchurch, and to carry on the same and the business of manufacturers and repairers of, and dealers in automobiles, motor-cars, &c. The first directors are:—J. Adamson, Junr., Stanpit House, Stanpit, Christchurch; T. W. Wood, Avon Wharf, Christchurch; J. B. Moncrieff, The Cottage, Buxhall, Stowmarket. Qualification, 100 shares. Secretary: J. Adamson, Junr. Solicitor: C. G. Lester, Waterloo Chambers, Bournemouth. Registered office: 8, Rotten Row, Christchurch.

Hawk Radio Devices, Ltd. (204,331).—Private company. Registered March 7th. Capital, £1,000 in £1 shares. To carry on the business of manufacturers of, and dealers in wireless, telephonic, and telegraphic apparatus of all kinds, &c. The subscribers (each with one share) are:—S. Karet, 17, The Ridgway, Golder's Green, N.W.11, gent.; Mrs. R. Karet, 17, The Ridgeway, Golder's Green, N.W.11. The first directors are not named. Solicitor: M. A. Pritchard, 161a, Strand, W.C.2.

Smith & Hammond, Ltd. (204,254).—Private company. Registered March 4th. Capital, £1,000 in £1 shares. To acquire the business of an electrical contractor and engineer carried on by F. H. Smith as Smith and Hammond. The subscribers (each with one share) are: F. H. Smith, 7, Raven Road, Camberwell, S.E.5, electrical engineer; Mrs. I. A. Smith, 7, Raven Road, Camberwell, S.E.5. F. H. Smith is the first director. No qualification required. Registered office: 5, Savoy Street, Strand, W.C.2.

Official Returns of Electrical Companies.

Morley Electrical Engineering Co., Ltd. (52,358).—Return dated February 23rd, 1925. Capital, £5,000 in £1 shares. All shares taken up. £3,980 paid. £1,020 considered as paid. Mortgages and charges, £3,000.

Thos. W. Ward, Ltd. (81,020).—Return dated October 14th, 1924. Capital, £1,350,000 in 150,000 first preference, 375,000 second preference, 725,000 ordinary, and 100,000 employés' shares of £1 each. 150,000 first preference, 375,000 second preference, 725,000 ordinary, and 36,316 employés' shares taken up. £882,353 paid. £403,963 considered as paid. Mortgages and charges, nil.

India Rubber, Gutta Percha and Telegraph Works Co., Ltd. (1,122c).—Return dated December 14th, 1924. Capital, £1,250,000 in 750,000 ordinary, 250,000 preference, and 250,000 unissued shares of £1 each. 750,000 ordinary and 250,000 preference shares taken up. £1,000,000 paid. Mortgages and charges, £400,000.

Venezuela Telephone and Electrical Appliances Co., Ltd. (31,305).—Return dated December 25th, 1924. Capital, £140,000 in 70,000 ordinary and 70,000 preference shares of £1 each. All shares taken up. £83,494 paid. £56,506 considered as paid. Mortgages and charges, £140,300.

A. J. Bennett & Weaver, Ltd. (Old Co.).—R. Stephens, of 31, Lombard Street, E.C.3, ceased to act as receiver or manager on December 31st, 1924. (Notice filed March 6th, 1925.)

Electrolite, Ltd.—S. R. Worley, of 23, Bush Lane, E.C.4, was appointed receiver on February 28th, 1925, under powers contained in debentures dated May 6th, 1913, and August 17th, 1914.

Electrical Contracts and Maintenance Co. (1925), Ltd.—Debenture dated February 24th, 1925, to secure £250, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: M. M. Howie, 7, King Street, Cheapside, E.C.

Cambrian Electrolytic Zinc Co., Ltd.—Issues on August 31st, 1923, of £4,000; on October 16th, 1923, of £2,000; and on December 19th, 1923, of £1,000 debentures, parts of a series already registered. (Notice filed March 6th, 1925.)

Jesmond Electrical and General Engineering Co., Ltd.—Debenture dated February 27th, 1925, to secure £1,051 charged on the company's undertaking and property, present and future, including uncalled capital. Holders: C. H. Baker, City Square, Leeds, and W. Curtis, 30, Gallowgate, Newcastle-upon-Tyne.

Speedex, Ltd.—Second debenture dated March 4th, 1925, to secure £1,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: J. E. Blurton, 425, Hagley Road, Edgbaston.

Magic Appliances, Ltd. Now Anglo Electric Co., Ltd.—Satisfaction in full on February 12th, 1925, of debentures dated September 13th, 1920, and December 2nd, 1921, securing £4,000.

Allen West & Co., Ltd.—Satisfaction in full on February 27th, 1925, of debentures dated January 23rd, 1912, to March 13th, 1918, securing in all £100,000.

First debenture dated February 27th, 1925, to secure £60,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Bishopsgate Nominees, Ltd., 13, Bishopsgate, E.C.2.

Radio Improvements, Ltd.—Satisfaction in full on February 19th, 1925, of debenture dated December 19th, 1923, securing £100.

Electrical and Allied Instrument Manufacturing Co., Ltd.—Satisfaction in full on February 23rd, 1925, of debenture dated May 10th, 1924, securing £350.

H. T. Wilson, Ltd.—Satisfaction in full on February 27th, 1925, of debenture dated January 29th, 1925, securing £62.

City Notes.

Charing Cross Electricity Supply Co., Ltd.

Mr. W. F. Fladgate, M.V.O., presided at the annual meeting, on March 10th, and in presenting the report and accounts (which were reviewed in our last issue, p. 426), said that the year's working had been very satisfactory. In connection with the West End undertaking, he said that the expenses were a great deal higher, due principally to the increased cost of coal and the expenditure of £10,685 on the renewal of mains. The decrease in the prices charged by the City undertaking did not take effect until the last quarter of the year and the receipts were consequently not affected to so great an extent as those of the West End undertaking. It was possible that the two accounts would be consolidated if the Bill of the London Electricity Joint Committee was passed. The number of kWh sold during 1924 was 45,644,347, as compared with 42,589,434 kWh in 1923; about 2½ million kWh of the increase was for lighting. Notwithstanding an increase in the price of coal, the generating costs at the Bow station were reduced by 9 per cent. Before the improvements were made at the Bow station the capacity was limited by the cooling towers to 25,000 kW. Arrangements had been made to obtain a supply of cooling water from the River Lea, sufficient for a capacity of 70,000 or 80,000 kW. New boiler plant had been installed, and in the engine room there were four sets with a total capacity of 36,000 kW. A fifth set of 16,000-kW capacity would be put into operation before the end of the current year. The efficiency of the works had been so improved that the coal consumption per kWh last year was only half that of 1919. The substantial economies effected in the matter of repairs, coupled with the reduction in the price of coal, had reduced the cost of production since 1920 by one-half. The total cost of this reconstruction work would be in the neighbourhood of £800,000. These extensions and extensions of the trunk mains and sub-station plant had been financed in a very economical way. About £580,000 had been spent out of revenue, and the company had raised £249,000 in notes and £122,616 in ordinary shares. The improvement of a station in this way was far more economical than the erection of a super-station. The actual capital cost of the extended plant would not exceed £15 per kW. The consumers had benefited by substantial reductions during the last four years.

The Chairman then reviewed at some length the effect of the schemes which were afoot for the reorganisation of the supply of electricity in London. The report and accounts were adopted and at a subsequent extraordinary meeting the directors were empowered to take such steps as they considered necessary in the interests of the company in connection with the above-mentioned reorganisation.

Durelco, Ltd.

The Earl of Kintore presided at the annual meeting of the company on March 11th. In presenting the report for 1924, he reviewed the constitution and objects of the company, stating that it was formed to consolidate the interests of Duram, Ltd., Metal Manufacturers, Ltd., and Cryselco, Ltd. The amount of capital raised by the issue of shares was inadequate, and debentures were issued, the charges on which constituted a heavy burden.

Metal Manufacturers, Ltd., of whose capital the company held 99 per cent., was formed to develop the manufacture of molybdenum wire for electric lamps, but owing to foreign competition this was unremunerative, and the business of the company was merged with that of Duram, Ltd., to obtain one establishment. The company held 98.5 per cent. of the capital in Duram, Ltd., which had incurred a loss of £5,028 in 1924, owing to a drastic revaluation of stocks. Cryselco, Ltd., had secured a licence to manufacture gasfilled lamps, and under this arrangement made a profit of £10,194, which, however, was reserved to strengthen the company's financial position. The accounts for the first half of the company's current financial year showed substantial improvement.

Commander O. Locker-Lampson, C.M.G., D.S.O., M.P., drew attention to the size of the board and the fees of the directors, and suggested that a reduction in both directions would create additional confidence in the shareholders. The chairman promised to discuss the matter with his colleagues, and the report and accounts were adopted.

Brompton and Kensington Electricity Supply Co., Ltd.

The report for the year ended December 31st, 1924, records a credit balance of £52,407, to which are added £8,454 brought forward and interest amounting to £593, making £61,454. After allowing for interim dividends there remains a balance of £46,577, which is to be distributed as follows:—To depreciation account, £19,821 (making £100,000); to reserve fund account, £6,897 (making £30,000); final preference dividend, £236; final ordinary dividend, making 10 per cent. for the year, free of tax, £14,591; leaving £4,982 to be carried forward. A table of progress shows the following increases during the year:—Equivalent of 35-W lamps connected from 539,519 to 561,559; number of consumers connected from 9,065 to 9,389; and gross receipts from £124,157 to £130,939. After the ordinary meeting on March 26th, the shareholders will be asked to give the directors power to take any steps which they consider necessary in connection with the schemes for the reorganisation of London's electricity supply.

Notting Hill Electric Lighting Co., Ltd.

The annual meeting of the company was held on March 10th under the chairmanship of Mr. A. E. Franklin. In moving the adoption of the report and accounts (Elec. Rev., March 6th, p. 386), the Chairman said that the statement of share capital showed no alteration, but there was still £56,000 of 6 per cent. preference shares remaining unissued and when the time came to capitalise the free reserves, the directors would probably make a proposal for dealing with them. The loan capital had been reduced by the redemption of £9,000 of the 7½ per cent. notes. The capital expenditure during the year included £1,900 for land and buildings, being part of the cost of a new sub-station in North Kensington; £10,000 for new mercury-arc rectifiers; and £10,500 for new mains and meters. Notwithstanding a reduction of 1d. per kWh in the charge for energy, there was an increase of £4,800 in the revenue. The Chairman then spoke of the effect of the load upon prices, and the chief engineer (Mr. A. P. McDonall, M.I.E.E.), explained a load chart. During the year they expected to ascertain exactly what their surplus reserve was; they would then be in a position to fund that reserve. The number of kWh sold during the year was 5,333,625, as compared with 4,815,273 kWh in 1923. The Chairman then reviewed at some length the provisions of the London Electricity Supply (No. 2) Bill, and the arrangements for a bulk supply from the Central Company. He concluded with a justification of the dividend upon the deferred shares and a tribute to the staff. The report and accounts were adopted and a resolution increasing the directors' fees was approved. An extraordinary meeting followed, at which the directors were given power to take such steps as were necessary in connection with the reorganisation of supply schemes which were pending.

British Insulated and Helsby Cables, Ltd.

The profit for 1924 was £366,751 (as compared with £347,695 for 1923), plus £412,873 brought forward, making a total of £779,624. From this are deducted:—Directors' and debenture trustees' fees and remuneration to works committee, £9,955; interest on debenture stocks, £33,552; dividend on preference shares, £30,000; interim dividend on ordinary shares to June 30th, 1924, £50,000; leaving a disposable balance of £656,117. Of this there has been appropriated for depreciation on buildings, plant, machinery, &c., £75,000, to reserve account £109,407, and to special reserve account £150,000. A further dividend of 5 per cent. on the ordinary shares is recommended, together with a bonus of 5 per cent., making a total distribution of 15 per cent. for the year, leaving £221,710 to be carried forward. The directors report a considerable increase in business, although at a lower rate of profit, but nevertheless they consider the result satisfactory. Meeting: Liverpool, March 23rd.

Newcastle-upon-Tyne Electric Supply Co., Ltd.

The profit for the past year was £660,408, as compared with £619,666 in 1923. Against this the following have been charged:—Debenture and loan interest, &c., £183,857; transfer to reserve for special depreciation and contingencies, £150,000; and transfer to plant renewal and improvement reserve, £50,000. This leaves £276,551, and the addition of £32,442 brought forward makes available £308,993. After paying the final preference dividends it is proposed to pay a final dividend of 4½ per cent. on the ordinary shares, making 7 per cent. for the year, and to carry forward £38,167. The expenditure upon plant renewals and improvements during the year amounted to £49,780; this has been charged against the reserve for this purpose. The capital expenditure amounted to £234,973, principally in connection with machinery and mains. The report states that the issue of 465,000 ordinary shares of £1 each which was made in January last to the holders of the 5 per cent. preference and ordinary shares was considerably over-subscribed. Meeting: March 24th.

Chelsea Electricity Supply Co., Ltd.

The report for 1924, which was to be presented at the annual meeting on Wednesday last, shows a profit of £64,258. To this is added £5,235 brought forward and £3,847 interest, making a total of £73,340. Debenture stock interest and interim dividends absorb £16,283, leaving a balance of £57,057, which it is proposed to allocate as follows:—To reserve for renewals, depreciation and contingencies, £17,000; to reserve fund, £15,000; final preference dividend, £900; final dividend on the ordinary shares at the rate of 15 per cent. (making 12 per cent. for the year), £18,539; leaving £5,618 to be carried forward. The connections increased during the year by 304 kW to a total of 11,816 kW, and the number of kWh sold rose by 798,796 to 6,531,537. Reference is made in this, as in other reports, to the reorganisation schemes which are under consideration in connection with electricity supply in London.

Swiss Aluminium Company.

The accounts of the Aluminium Industrie, A.G., of Neuhausen, show net profits of 11,546,000 fr. for 1924, as compared with 8,038,000 fr. in the previous year, and it is proposed to pay a dividend at the rate of 15 per cent. as against 12 per cent. in 1923. A sum of 2,000,000 fr. is transferred to the share paying-up fund, 800,000 fr. is placed to the reserve fund, and 1,400,000 fr. to a special reserve fund. It is now intended to increase the share capital from 42,000,000 fr. to 50,000,000 fr., partly by the appropriation of 4,000,000 fr. from the share paying-up fund. Four new shares are to be offered to the shareholders for every 21 old shares at the price of 500 fr. per share. The amount carried forward from 1924 is 247,139 fr.

German Companies.

The *Electric Light and Power Investments Company*, of Berlin, in issuing its Reich mark balance sheet for the year ended with September 30th, 1924, states that allowance has been made for the losses of the participations in Russia, Poland, Italy and Alsace.

The report for 1923-24 of the *Electricity Company* (late Schuckert), of Nuremberg, states that as a financing and holding undertaking the company is almost exclusively dependent upon the yield of its shareholdings and participations and that as all companies remained without dividends during the past year in consequence of the position caused by the inflation, the company's receipts had been insignificant and the most economical administration had been necessary. The net profits of 37,000 marks have been carried forward.

Bristol Tramways and Carriage Co., Ltd.—The report for the past year which was to be presented at the annual meeting yesterday shows a revenue of £982,803 and expenses and renewals amounting to £895,661, leaving a balance of £87,142, to which is added £2,151 brought forward, making £89,293. Debenture interest, &c., and interim dividends absorbed £64,312, the final dividend on the ordinary shares, making 6 per cent. for the year, required £20,343, and a balance of £4,637 is carried forward. The reserve fund now stands at £343,277. The number of passengers carried by the company's cars and motor omnibuses was 91,484,503, as compared with 82,745,228 in 1923. The tramway fares were reduced during the year, but although the traffic revenue decreased, the working expenses did not fall.

Imperial Tramways Co., Ltd.—The report for 1924 shows that after paying debenture interest and the interim preference dividend there is a balance of £17,194. It is proposed to pay the remainder of the preference dividend and carry forward £5,078. The dividend received in respect of the company's holding in the Bristol Tramways & Carriage Co., Ltd., was 6 per cent. No return was received from the holding in the London & Suburban Traction Co., Ltd.

Radio Corporation of America.—The net profit for 1924, after providing for depreciation, was $9,503,442, as compared with $4,737,774 in 1923. Of this amount $2,364,908 has been transferred to reserves for patents, income tax, and organisation expense; the preference dividend absorbed $1,384,591; and $3,356,651 has been credited to the surplus account. The balance, $2,397,292, has been applied to provide for losses sustained on investments in associated and subsidiary companies, &c. No dividend has been paid on the common stock for 1924. During the year the capital was reorganised, the number of shares was reduced and their individual value increased correspondingly.

Isle of Thanet Electric Supply Co., Ltd.—The annual meeting of this company was held on March 11th, and the chairman (Mr. A. R. Monks), in presenting the report (*vide* our last issue, p. 426), said that the finances of the company were now on a satisfactory basis, and the market value of the shares had appreciated considerably. Applications for lighting and power were being received at a rapid rate, enabling them to look forward to an increasing revenue. It was hoped to have the Westgate and Birchington supply in operation shortly after Easter.

Midland Electric Corporation for Power Distribution, Ltd.—The report for 1924 shows a net profit of £152,471, which, together with £43,884 brought forward, makes available £196,355. Debenture interest, &c., depreciation (£40,000), transfer to reserve (£50,000), preference dividend, and interim ordinary dividend absorb £140,780, leaving a balance of £55,575. It is proposed to pay a final dividend of 5 per cent. on the ordinary shares (making 10 per cent. for the year), plus a bonus of 5 per cent., leaving £27,575 to be carried forward. Meeting: March 23rd.

Chiswick Electricity Supply Corporation, Ltd.—The total revenue for 1924 was £65,489, an increase of £7,935, and the profit balance (including £4,370 brought forward) was £31,971. It was proposed to pay a dividend of 15 per cent.; to refund £3,140 to consumers for 1924; to transfer £10,000 to depreciation reserve and £5,000 to general reserve; leaving £4,411 to be carried forward. The capital expenditure during the year was £14,800, divided about equally between the Chiswick and Aberystwyth undertakings.

Newcastle and District Electric Lighting Co., Ltd.—The net profit for 1924, after charging debenture and loan interest, allowing £18,000 for depreciation, and placing £4,000 to general reserve, was £16,364; the addition of £14,582 brought forward renders £30,946 available. A dividend at the rate of 6½ per cent. is to be paid, and a balance of £15,834 carried forward. During the year £1,000 of second mortgage debentures was redeemed, and loans amounting to £3,955 were repaid.

British Aluminium Co., Ltd.—A preliminary statement of accounts for the past year shows a profit of £139,330, after providing for debenture charges, and transferring £50,000 to depreciation reserve, £120,000 to the reserve fund, and £10,000 to the staff benefit fund. A final dividend at the rate of 15 per cent. (making 10 per cent. for the year) is recommended on the ordinary shares, and £21,243 is to be carried forward.

Tees Power Station Co., Ltd.—The report for the quarter ended December 31st last states that the authorised share capital has been increased to £935,000; 316,381 fully-paid ordinary shares have been allotted to the Newcastle-upon-Tyne Electric Supply Co., Ltd.; and the total issued and paid-up capital is now £912,978. Out of profits of £18,017 for the quarter a dividend of 2¼ per cent. is to be paid, and £1,231 carried forward.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Northampton Electric Light and Power.—304,123 ordinary "B" shares of £1 each, fully paid, Nos. 29,991 to 99,990, 106,110 to 198,710, and 200,001 to 341,322.

Application has been made to the Committee to allow the following to be officially quoted:—

Adelaide Electric Supply.—£350,000 5½ per cent. redeemable consolidated debenture stock.

Adelaide Electric Supply.—500,000 6½ per cent. "C" cumulative preference shares of £1 each, fully paid, Nos. 1 to 500,000.

Chili Telephone.—31,200 shares of £5 each, fully paid, Nos. 118,801 to 150,000.

Midland Counties Electric Supply.—25,000 ordinary shares of £1 each, fully paid, Nos. 975,001 to 1,000,000; and 250,000 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 750,001 to 1,000,000.

Shropshire, Worcestershire, and Staffordshire Electric Power.—£650,000 5½ per cent. first debenture stock.

Pinchin, Johnson & Co., Ltd.—The net profit for 1924 was £127,256, including the amount brought forward and profit on the sale of property. It is proposed to pay a final dividend of 22 per cent. (actual) on the ordinary shares, making 30 per cent. for the year (as against 22½ per cent. in 1923). After transferring £25,000 to reserve (as compared with £10,000), £30,478 (£23,159) is to be carried forward.

Para Electric Railways and Lighting Co., Ltd. — At a meeting of the holders of the company's 5 per cent. first debenture stock on March 9th, it was decided not to register the local mortgage in Brazil. In the opinion of the trustees the advantages to be gained from registering were somewhat illusory, while the risks might be considerable.

Direct Spanish Telegraph Co., Ltd.—The following dividends are recommended in respect of the past year:—10 per cent. on the preference shares, less tax, and 10 per cent. on the ordinary shares free of tax. An interim dividend of 4 per cent. was paid on the ordinary shares in October last.

Shawinigan Water and Power Co.—The gross earnings during 1924 totalled $5,741,079, and the operating expenses $2,420,528, leaving a net income of $3,320,551, as compared with $3,170,892 in 1923. The balance, after providing for bond interest and depreciation, was $1,695,969.

French Company.—The report of the *Société des Tramways Electriques et Omnibus de Bordeaux* for the last financial year, shows a net profit of 2,037,080 fr., as compared with 2,114,066 fr. in 1923.

Waste Heat and Gas Electrical Generating Stations, Ltd.—Out of profits amounting to £38,853 (including £12,945 brought forward) it is proposed to pay a final dividend making 8 per cent. for the year and to carry forward £13,253.

Electric Supply Corporation, Ltd.—A final dividend of 6 per cent. (making 10 per cent. for the year), plus a bonus of 1 per cent., has been declared on the ordinary shares. The 1923 dividend was 10 per cent.

Metropolitan-Vickers Electrical Co., Ltd.—A dividend of 8 per cent. (as in 1923) is recommended upon the ordinary shares, while a similar dividend is to be paid on the preference shares.

Belgian Company.—La Société des Tramways Electriques du Pays de Charleroi et Extensions reports a net profit of 728,654 fr. for the last financial year, as compared with only 657,185 fr. in the preceding year.

South Staffordshire Tramways Co.—Including £268 brought forward, the balance available for 1924 is £3,157. It is proposed to pay a dividend of 4 per cent. on the 6 per cent. preference shares (as in 1923) and to carry forward £117.

Cammell, Laird & Co., Ltd.—The profit balance for 1924 was £106,910, as against £99,277 in 1923. The full preference dividend is paid and £45,649 is carried forward.

County of Durham Electrical Power Distribution Co., Ltd.—A dividend of 6 per cent. (as in 1923) is announced on the ordinary shares.

Alley & Maclellan, Ltd.—The half-yearly preference dividend is to be paid, £10,572 is provided for depreciation, and £6,676 is carried forward.

Quebec Railway, Light, Heat and Power Co.—A dividend of $1¼ per share has been declared on the preferred shares for the quarter ending March 31st.

Liverpool Overhead Railway Co. — A dividend of 5 per cent. is being paid from the compensation fund upon preference shares for the year ended December 31st last.

Manila Electric Corporation.—A dividend of 62½ cents per share is announced on the common stock for the quarter ending March 31st.

Ward & Goldstone, Ltd.—An interim dividend of 8 2/5d. has been declared upon the ordinary shares.

Stocks and Shares.

MONDAY EVENING.

As the end of March approaches, the queasiness of the Stock Exchange in regard to possible money tightness becomes more pronounced. Six per cent. as a temporary Bank Rate is held by the pessimists to be a live possibility, though the chief authorities are against this as a likely chance. At any rate, the money situation is exercising an unquestionable influence in Stock Exchange markets. Agreement is reached in the expectation of a return to easier conditions as soon as April appears.

Home Railway stocks have been acutely flat. Prices went down with comparatively little stock changing hands. The sharpness of the drop wrought its own cure, and buyers came forward whose purchases promptly restored prices to more normal levels. The Undergrounds moved less abruptly than the steam stocks. On balance, Metropolitan stands a point higher, and the others show no change. The London, Midland and Scottish Railway have formed a special department, in order to deal with their electric traction. The Southern Railway will open a further electrified section of the Brighton line next month. When finished, the Southern Railway electrical routes will cover 650 miles of track. The company's present scheme, which should be complete in fourteen or fifteen months' time, is budgetted to cost eight million pounds.

People are asking, with keen attention, what they should do with their holdings of shares in the London Electricity Supply Companies. Most of the proprietors could take handsome profits if they cared to sell their shares at to-day's prices. Ingenious estimates are prepared, from time to time, that purport to show how share-values will stand after the new Bills are passed by Parliament. Some of the guesses may be thought to give glimpses of inspiration in addition to illumination, and probably the results will approximate fairly closely to the forecasts. But it is well to remember that the estimates are, after all, not much more. The outlook remains uncertain and obscure. In such circumstances, the Stock Exchange habit is to let prices dwindle. With the electric lighting list, the reverse process is in evidence. Values are not only maintained but, where they change, the movement is generally upward. Kensingtons this week are 5s. higher, at 11¼, and the other shares in the group are very firm.

Clyde Valley have strengthened to 32s. Midland Counties and Newcastle Electric attract steady investment. The Tees Power Station Company announces a dividend of 2¼ per cent. for the quarter ended last December, the rate being ¼ per cent. down, but the dividend being paid upon £316,000 more capital. The actual profit rate over the period has increased. Tokyo Electric 6 per cent. sterling bonds are quoted at 88½, and Whitehall Electric 6 per cent. first mortgage debenture stock can be bought at 99½, which includes the six months' interest payable next month. The stock is well secured, and the company's 7½ per cent. preference shares stand at 20s.

Barcelona Traction 6½ per cent. consolidated prior-lien bonds deserve attention from the speculative investor who can afford to accept what risk is involved by the purchase of stock giving 7¼ per cent. on the money at the bonds' current price of 89. Interest is due in June and December. On last year's published profits, the interest service of these bonds was covered three times over.

Modest amounts of stock can be obtained in Urban Electric 5½ per cent. debenture, June and December interest, at 103; of Newcastle-on-Tyne 4½ per cent. first debenture at 94¼; Isle of Thanet Electric 4 per cent. debenture at 78, January and July being the interest months in both the two last-named cases. Investment which may find these hints are provocative of attention should obtain details of redemption of the stocks. Manifestly there is no great risk of loss on repayment if the price of a stock is under, or not much above, 100. It is where prices stand at a substantial premium that there lurks sometimes unexpected disappointment for holders who had not appreciated that their stocks were liable to redemption at par, or thereabouts, at some date earlier than had been realised.

British Columbia Electric stocks are dull, for some reason which the market finds it difficult to explain. Foreign traction issues are generally heavy. In the London list, a fall of 2 points occurred in London United 4 per cent. debenture.

Cable and telephone issues are very uninteresting. The Eastern Telegraph list has not moved. United River Plates went back a little. Automatic Telephones strengthened to 35s. No feature of interest has developed in the wireless market. New Marconis are 5s. 3d. premium. Canadian Marconis lost a few pence at 5s. 6d. Radio Common at 12 and the preferred at 10½ are arousing little interest over here. The Direct Spanish Telegraph repeats its previously paid 10 per cent. tax-free dividend on the ordinary shares, the price of which is £9 middle. The 10 per cent. preference are 7½: the nominal value of the shares is £5 in each case.

British Insulated hold their rise at 3½. The annual report shows an increase in profits of £19,000, at £366,750. The company declares a dividend and bonus making, again, 15 per cent. for the year. British Aluminium hardened to 30s. 9d. Cromptons are better at 15s. Siemens, General Electrics and India Rubber shares have shed small amounts. The rubber share market is heavy, its prices disposed to dulness. Iron and steel descriptions are no better, the public interest in the market being of the rather melancholy type which comes from the determination to hold on to shares in a dry market, but to buy no more until general trade shows more disposition to revive.

Share List of Electrical Companies.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Mar. 16. 1925.	Rise or fall.	Yield. p.c.
Home Electricity Companies.						
Bournemouth and Poole ...	1	13	14	29/3	—	4 19 8
Brompton Ordinary	1	10	10	18	—	*5 6 8
Charing Cross Ordinary	1	14½	15	46/3	—	6 9 7
do. do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	12	37/6	—	6 8 0
City of London	1	15	15	49/-	—	6 2 6
do. do. 6% Pref. ...	1	6	6	23/6	—	5 2 2
Clyde Valley	1	8	8	32/-	+1/-	5 3 3
County of London	1	15	15	55/-	—	5 8 6
do. do. 6% Pref. ...	1	6	6	23/6	—	5 2 2
Edmundson's Ordinary	1	7	—	21/6	—	6 10 4
do. 7% Pref.	1	6	—	23/-	—	6 1 9
Elec. Supply Corporation ...	1	10	10	28/-	+1/-	7 2 0
Kensington Ordinary	5	14	15	11⅝	+ ¼	6 9 0
Lancs. Light and Power ...	1	7½	7½	27/-	—	5 11 1
London Electric	1	10	10	37/-	—	5 8 1
do. do. 6% Pref. ...	5	6	6	5½	—	5 9 1
Metropolitan	1	10	11	39/-	—	5 12 10
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	23/3	—	5 3 3
Newcastle-on-Tyne Ordinary ...	1	6	7	23/9	—	5 18 0
do. 5% Pref. ...	1	5	5	18/9	—	5 6 8
do. 7% Pref. ...	1	7	7	24/9	—3d.	5 13 2
Notting Hill 6% Pref.	10	6	6	9½	—	6 4 5
North Met. Elec. 6% Pref. ...	1	6	6	1¼	—	5 6 8
St. James' and Pall Mall ...	5	17½	17½	13	—	6 14 7
South London	1	15	15	2⅝	—	5 17 0
South Metropolitan Pref. ...		7	7	1¼	—	5 12 0
Urban Ordinary	1	4	—	1	—	4 0 0
do. 6% Pref.	1	6	—	1	—	6 0 0
Westminster Ordinary	5	15	15	10⅜	—	6 19 8
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/-	—	5 10 4
Home Rails.						
Central London Ord. Assented	Stock	4	4	71	−2	5 12 8
Metropolitan	„	4	5	79½	+1	6 6 0
do. District	„	3½	3½	49½xd	—	7 1 5
Underground Electric Ordinary	10	Nil	Nil	2⅜	—	Nil
do. do. "A" ...	1	Nil	Nil	7/6	—	Nil
do. do. Income	Bonds	6	6	98	—	*6 2 5
Telegraphs and Telephones.						
		Dividend. 1922.	Dividend. 1923.			
Anglo-Am. Tel. Pref.	Stock	6	6	105	—	5 14 3
do. Def.	„	1½	1½	24	+ ½	6 5 0
Automatic Telephone	1	Nil	3	1⅜	+ 1/16	3 8 7
Chili Telephone	5	6	6	5⅞	—	*5 7 10
Cuba Sub. Ord.	10	7	7	7½	—	9 13 2
Eastern Extension	10	10	10	17⅞	—	*5 12 8
Eastern Tel. Ord.	Stock	10	10	175½	—	*5 14 0
Globe Tel. and T. Ord.	10	10	10	18	—	*5 11 1
do. do. Pref.	10	6	6	11½	—	5 7 10
Great Northern Tel.	10	24	22	31⅜	—	6 18 4
Indo-European	25	7	7	33½	—	*5 6 1
Marconi	1	15	10	1⅞	—	5 14 6
Marconi Marine	1	10	10	1⅛	—	8 17 10
Oriental Telephone Ord. ...	1	12	12	2½	—	*5 9 7
United R. Plate Tel.	5	8	8	6⅛	−⅛	*5 15 4
Western Telegraph	10	10	10	17½	—	*5 14 3
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref. ...	5	19½	5½	8⅛	—	8 9 2
do. do. 2nd Pref. ...	5	5½	6	3	−1/16	10 0 0
do. do. 5% Deb. ...	Stock	5	5	75½	−1	6 12 5
British Electric Traction Ord. ...	„	5	6	101½	—	5 18 3
do. do. 6% Pref. ...	„	6	6	106½	—	5 14 9
Brazil Traction	100	4	4	56½	−½	7 1 7
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	91½	—	5 9 1
do. do. Preferred	„	5	95/-	91½	—	*5 4 8
do. do. Deferred	„	8	129/5	108½	−2½	*5 19 3
do. do. Deb.	„	4½	4½	81½	—	5 4 4
Lond. & Sub. Trac. 5% Pref. ...	1	5	2½	5/6	—	Nil
London United Tram. Deb. ...	Stock	4	4	49½	−2/-	8 1 7
Mexico Trams, 5% Bonds ...	—	Nil	5	71	—	7 0 10
Mexican Light Common ...	100	Nil	Nil	25	—	Nil
do. Pref.	100	Nil	Nil	62½	−½	Nil
do. 1st Bonds ...	—	5	5	69½	+1	7 3 11
Yorkshire (West Riding) ...	1	—	5	1	—	5 0 0
Manufacturing Companies.						
Babcock & Wilcox	1	20	12	56/3	—	*4 5 8
British Aluminium Ord.	1	5	5	30/9	+9d.	3 5 0
British Elec. Transformer Pref.	1	Nil	Nil	17/6	—	... ...
British Insulated Ord.	1	15	15	3⅞	—	4 16 0
Brush Ord.	1	10	10	28/3	—	7 12 4
Callenders	1	15	15	3¾	—	4 12 4
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	5	Nil	⅜	+ 1/16	... ...
Edison-Swan	4/-	7½	10	7/9	—	5 3 3
do. 5% Deb.	Stock	5	5	81½	—	6 0 3
Electric Construction	1	10	10	32/6	—	6 3 1
Enfield Cable, Pref.	1	7½	7½	1¼	—	6 0 0
English Electric	1	8	6	20/-	—	5 0 0
do. do. Pref.	1	6	6	21/6	—	5 11 7
Gen. Elec. Pref.	1	6½	6½	24/-	—	5 8 4
do. Ord.	1	5	5	22/9	−6d.	4 7 11
Henley	1	15	15	3¾	—	4 12 4
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	10	5	19/3	—3d.	*5 3 11
Johnson & Phillips	1	5	5	1⅜	—	3 4 0
Met-Vickers, Ord.	1	19½	8	1¼	—	6 8 0
do. Pref.	2	8	8	2½	—	6 8 0
Siemens Ord.	1	5	—	26/6	−6d.	3 15 6
Telegraph Construction	12	20	20	27½	+	*4 6 6

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.		Price Mar. 17.	Fortnight's Inc. or dec.
a Acid, Oxalic	per lb.	6¾d.	...
a Ammoniac, Sal	per ton	£60	...
a Ammonia, Muriate (large crystal)	„	£52	...
a Bisulphide of Carbon	„	...	...
a Borax	„	£25	...
a Copper Sulphate	„	£25 10s.	...
a Potash, Chlorate	per lb.	4d. to 4¼d.	...
a „ Perchlorate	„	5½d.	...
a Shellac	per cwt.	£15 15s.	...
a Sulphur, Sublimed Flowers ...	„	£7 15s.	...
a „ Roll	„	£7 15s.	...
a Soda, Chlorate	per lb.	3¼d. to 3½d.	½d. to ¾d. inc.
a „ Crystals	per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ...	per lb.	4d.	...
METALS, &c.			
b Aluminium, Ingots	per ton	£120 to £125	...
b „ Wire	per lb.	1/9 to 2/6*	...
b „ Sheet	„	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—			...
Grade I	per ton net	£225	£7 dec.
Grade II	„ „	£163	£6 dec.
Grade III	„ „	£93	£5 dec.
c Brass (rolled metal 2" to 12" basis)	per lb.	9½d.	½d. dec.
c „ Tubes (solid drawn) ...	„	1/0¾ to 1/0½	...
c „ Wire, basis	„	10½d.	½d. dec.
c Copper Tubes (solid drawn) ...	„	1/1½	...
c „ Bars (best selected) ...	per ton	£95	...
c „ Sheet	„	£95	...
c „ Rod	„	£96	...
d „ (Electrolytic) Bars ...	„	£68 15s.	5/- dec.
d „ „ Sheets ...	„	£143 10s.	...
d „ „ Wire Rods	„	£78 15s.	5/- dec.
d „ „ H.C. Wire	per lb.	9¼d.	...
f Ebonite Rod	„	2/- to 3/6	...
f Sheet	„	2/- to 3/6	...
n German Silver Wire	„	2/3	...
h Gutta-percha, fine	„	8/6	...
h India-rubber, Para fine	„	1/5½	¼d. inc.
f Iron Pig (Cleveland Warrants) ...	per ton.	£5 2s. to £5 2s. 6d.	...
f „ Wire, galv. No. 8, P.O. qual.	„	£23	...
g Lead, English Pig	„	£28 15s.	5/- dec.
g Mercury	per bot.	£13 10s. to £13 15s.	2½/- inc.
e Mica (in original cases) small ...	per lb.	3d. to 8/-	...
e „ „ medium	„	4/- to 8/-	...
e „ „ large ...	„	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings	„	1/9½	...
p „ „ drawn bars & rods	„	1/9	...
p „ „ rolled strip & sheet	„	1/9½	...
p „ „ wire	„	1/4	...
o Platinum	per oz.	£26	...
d Silicium Bronze Wire	per lb.	1/6½	...
r Steel, Magnet, in bars	„	7½d.	...
e Tin, Block (English)	per ton.	£242 5s. - £242 15s.	£2 15s. dec.
n „ Wire, Nos. 1 to 16	per lb.	4/2	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

B.E.S.A. Publications.—The British Engineering Standards Association has just published the following two specifications:—

No. 190—1924.—Dimensions for British Standard Whitworth (B.S.W.) Bright Hexagon Bolts, Set-screws and Nuts, Split-pins, Washers and Studs.

No. 191—1924.—Dimensions for British Standard Fine (B.S.F.) Bright Hexagon Bolts, Set-screws and Nuts, Split-pins, Washers and Studs.

Both of these publications give the overall dimensions for bright hexagon bolt heads, set-screws, lock-nuts, castle nuts and slotted nuts for sizes up to and including 2 in.; the dimensions for screw threads are not included as they are contained in previous specifications. In each specification the tensile strength of the material is laid down, that for B.S.W. bolts and nuts being 28 tons per square inch minimum and for B.S.F. 32 tons per square inch minimum. Specification No. 190—1924 supersedes table 1 of publication No. 28—1908, nuts, bolt-heads and spanners and the parts which deal with castle-nuts, whilst specification No. 191—1924 supersedes publication No. 54—1911, threads, nuts and bolt-heads for use in automobile construction.

The dimensions in each publication are arranged in tables, and a clearly illustrated note of explanation accompanies each table. For the convenience of the drawing office, workshop and garage, the material contained in each of these publications has also been issued in varnished chart form, 21 in. by 33 in. These charts bear the same numbers as the specifications with the addition of a suffix letter C. Both forms of each publication can be obtained from the Publications Dept., B.E.S.A., 28, Victoria Street, London, S.W.1, the ordinary specification at 1s. 2d. per copy post free and the charts at 1s. 3d. each post free.

The Austrian Electrical Industry.

(From our Vienna Correspondent.)

THE electrical industry of Austria stood at a high level in pre-war times, both as regarded the quality of the products and its capacity for production. The industry was greatly assisted by contracts made with German and Swiss firms, which secured the experience and patents of these firms, as well as those of certain English and American concerns. After the war, the manufacturers of electrical products greatly suffered on account of the political conditions and lack of raw material. Nevertheless, they resolved to adapt themselves to the most modern requirements. Although the demands of the small State were not able, by any means, to keep their establishments occupied, they set about enlarging and modernising their plant, as only in this way were they able to compete with foreign firms and preserve the good reputation of Austrian electrical products.

The industry is now in the position of being able to produce several times the quantity of electrical goods required by the home market, and is endeavouring to export the surplus. In these critical times it was very pleasing and a real boon to Austrian electrical manufacturers that the Bundesbahnen revived its scheme for electrifying its lines, building several hydro-electric plants for this purpose. This work has provided factories with sufficient orders to keep them working at top pressure.

Out of the water power available in the whole of Austria (about 12 million h.p.), up to the end of 1920 172,000 h.p. had been utilised, and from this time up to 1924, a further 108,000 h.p. was developed. At the present time another 109,000 h.p. is being harnessed. The production of the necessary machinery and electrical equipment has saved a great industry from standing idle, or at least, from being reduced to a very low level.

The manufacturers of standard electrical motors and other apparatus have no cause to complain, particularly those who supply apparatus for industrial and agricultural purposes. In this direction the Austrian industry has many pre-war connections which are still maintained, the principal buyers being in the Succession States. A great impetus has been given to the exportation of large quantities of electrical goods to Czecho-Slovakia by the Commercial Treaty between the two countries which came into force in January last. By this Austria has secured from 30 per cent. to 50 per cent. reduction in the import duty upon electrical apparatus, as well as other concessions. On the other hand, the duty upon electrical goods imported into Hungary has been raised to such a height that Austria finds it impossible to do business with that country. This represents a considerable loss to the Austrian electrical industry, as Hungary was previously a very large customer.

Poland is a considerable buyer of Austrian electrical goods, although the duties there are also very high. This is compensated for, however, by the inadequacy of Polish electrical production, which necessitates the importation of almost all kinds of electrical goods. A hindrance to smooth business in this direction, however, is the precarious financial conditions prevailing in Poland. The Balkan business also suffers from unstable financial conditions, but future prospects in this direction are favourable, as Austrian representatives in Rumania, Jugo-Slavia, and Bulgaria, have a strong hold upon these markets.

The principal task of the Austrian electrical industry in the near future is the maintenance of its competitive capacity. This means a further reduction of expenses, and it is considered that wages will have to be lowered.

The Electrical Imports of Czecho-Slovakia.

BELOW is a statement of the quantities of electrical and allied material imported into Czecho-Slovakia in 1923, based on the recently issued official statistics for that year. The corresponding figures for 1922 are added for purposes of comparison, together with notes of increases or decreases.

	1922. Kilo-grammes.	1923. Kilo-grammes.	Inc. or dec. Kilo-grammes.
Electric lamp bulbs—			
Total	9,500	6,000	– 3,500
Electrical insulators—			
Total	71,000	27,000	– 44,000
From Germany	63,000	24,000	– 39,000
Dynamos and motors, transformers and converters weighing 25 kg. or less—			
Total	113,000	103,000	– 10,000
From Germany	63,000	74,000	+ 11,000
,, Austria	47,000	19,000	– 28,000
,, Great Britain ...	1,000	3,000	+ 2,000
Ditto, ditto, weighing from 25 kg. to 5 quintals—			
Total	716,000	363,000	– 353,000
From Germany	480,000	222,000	– 258,000
,, Austria	221,000	125,000	– 96,000
,, Switzerland ...	5,000	10,000	+ 5,000
Ditto, ditto, weighing from 5 quintals to 30 quintals—			
Total	509,000	288,000	– 221,000
From Austria	323,000	149,000	– 174,000
,, Germany	173,000	126,000	– 47,000
,, Switzerland ...	—	6,000	+ 6,000
Ditto, ditto, weighing from 30 to 80 quintals—			
Total	272,000	133,000	– 139,000
From Germany	70,000	73,000	+ 3,000
,, Austria	202,000	50,000	– 152,000
,, Switzerland ...	—	11,000	+ 11,000
Ditto, ditto, weighing over 80 quintals—			
Total	284,000	213,000	– 71,000
From Germany	152,000	118,000	– 34,000
,, Austria	122,000	95,000	– 27,000
Telegraph and signalling apparatus, weighing 5 kg. or over—			
Total	15,000	14,000	– 1,000
From Austria	9,000	8,000	– 1,000
,, Germany	3,000	3,000	—
,, France	2,000	2,000	—
Ditto, weighing under 5 kg.—			
Total	3,500	2,000	– 1,500
Telephones, weighing 5 kg. or over—			
Total	29,000	69,000	+ 40,000
From Austria	22,000	55,000	+ 33,000
,, Germany	3,000	12,000	+ 9,000
Ditto, weighing under 5 kg.—			
Total	16,000	11,000	– 5,000
Lightning arresters, weighing 5 kg. or over—			
Total	4,000	5,000	+ 1,000
Ditto, weighing under 5 kg.—			
Total	1,000	1,000	—
Electrical measuring instruments, weighing 5 kg. or over—			
Total	101,000	59,000	– 42,000
From Germany	68,000	41,000	– 27,000
,, Switzerland ...	9,000	10,000	+ 1,000
,, Austria	24,000	7,000	– 17,000
Ditto, weighing under 5 kg.—			
Total	170,000	143,000	– 27,000
From Germany	124,000	104,000	– 20,000
,, Austria	22,000	21,000	– 1,000
,, Switzerland ...	13,000	15,000	+ 2,000
Switchgear—			
Total	38,000	19,000	– 19,000
Incandescent lamps—			
Total	156,000	102,000	– 54,000
From Germany	85,000	38,000	– 47,000
,, Hungary	30,000	28,000	– 2,000
,, Austria	30,000	19,000	– 11,000
,, Netherlands ...	8,000	16,000	+ 8,000
Electric lamp sockets—			
Total	25,000	16,000	– 9,000
From Germany	19,000	12,000	– 7,000
Regulators, resistances, &c.—			
Total	589,000	405,000	– 184,000
From Germany	335,000	250,000	– 85,000
,, Austria	241,000	138,000	– 103,000
,, Switzerland ...	2,000	7,000	+ 5,000
Cable and insulated wire, metal covered—			
Total	24,000	16,000	– 8,000
From Germany	10,000	9,000	– 1,000
,, Austria	13,000	6,000	– 7,000
,, Sweden	—	1,000	+ 1,000
Ditto, covered with paper or asbestos—			
Total	4,000	4,000	—
Ditto, covered with rubber—			
Total	5,000	2,000	– 3,000
Ditto, covered with asbestos, paper, rubber, &c.—			
Total	20,000	10,000	– 10,000
From Austria	12,000	5,000	– 7,000
,, Germany	6,000	4,000	– 2,000
Accumulators—			
Total	86,000	43,000	– 43,000
From Austria	45,000	31,000	– 14,000
,, Germany	37,000	11,000	– 26,000
Electric light carbons—			
Total	31,000	19,000	– 12,000
Electrodes—			
Total	481,000	367,000	– 114,000
From Germany	333,000	301,000	– 32,000
,, Austria	—	33,000	+ 33,000
,, United States ...	17,000	25,000	+ 8,000

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

"Bencolite" Lighting Fittings.

THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17, has put on the market a range of attractive electric lighting fittings for domestic and other applications. One of these "Bencolite" fittings is illustrated in fig. 1. This particular design is intended for hospitals, schools, or offices, although it can also be used in domestic

Fig. 1.—A "Bencolite" Fitting.

installations. It has the look of cleanliness, and the substitution of a white enamelled tube for the usual suspension chain eliminates a collector of dust. The fitting is of special glass, and is made in four sizes, to accommodate 60-, 100-, 200-, or 300/500-W lamps. There are three shapes available, that illustrated being "Design B."

A Disk Thermostat.

A thermostat which has a similar action to that of the bottom of an oil can has been put on the market by the SPENCER THERMOSTAT CO., Cambridge, Mass., U.S.A.

As described in the *Westinghouse International*, this device has three contact buttons, each of which is of sufficient size to give two separate breaks. They are rolled silver plated, as are the contacts, thereby reducing oxidation and corrosion of contacts to a minimum. With a total of six breaks in

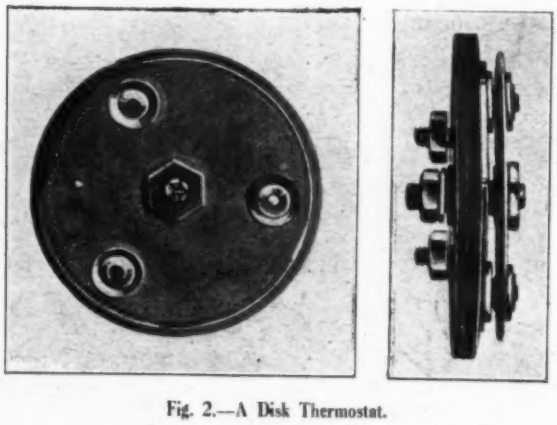


Fig. 2.—A Disk Thermostat.

series, it is not a difficult matter to break 1,000 W d.c. without the use of a relay; in other words, the thermostat is put directly in series with the load (an iron, kettle, or other small device), and no auxiliary circuit is necessary. The disk in which the buttons are mounted is in reality a spring moved by thermostatic action, and it does not wear out. A sample after 7,000 hours of continuous operation (about 325,000 movements) showed no sign of deterioration, and continued to work at the correct temperatures. The thermostat is illustrated in fig. 2.

New Circuit Breaker Designs.

The *American Machinist* gives particulars of two new electric circuit breakers, made by the ROLLER-SMITH CO., 233, Broadway, New York. One is known as the double-pole interlocked trip breaker. It is so designed that the two poles are closed independently and successively. If an overload exists, the first pole closed will open as soon as the second pole is closed. If the overload occurs when both poles are

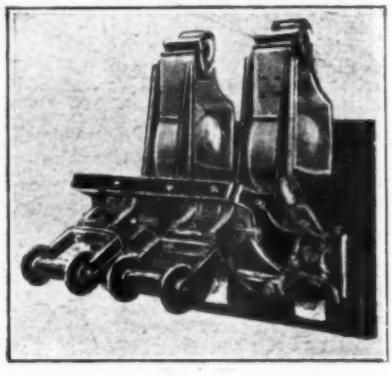


Fig. 3.—New Interlocked Circuit Breaker.

closed they will open simultaneously. This breaker, for use on motor and feeder circuits, is shown in fig. 3.

The second breaker, known as the shock-proof circuit breaker and intended for installation in places where excessive vibration exists, carries a shock-proof attachment suitable for any of the company's standard types of breakers.

Both types of breakers are built in seven standard sizes to carry from 5 to 3,000 A.

Hand-power Saw.

A novel "hand-power" saw is illustrated in the *Electric Railway Journal*. It consists of a small circular saw driven by an electric motor for use on either 110 or 220 V, a.c. or d.c. The saw and motor make a compact combination, which is held and guided in a similar manner to an ordinary hand saw. The saw is being marketed by the MICHEL ELECTRIC HAND SAW CO., Chicago, Ill.

"Simplex" Wiring Connectors.

Some time ago we described a novel form of connector for small wires, consisting of a hood of fibre with an internal screw thread. This was placed over the twisted ends of the wires and screwed tightly upon them. Mr. MARTIN BLAIR, Amberley House, Norfolk Street, Strand, W.C.2, has now sent us samples of a later development of this device by his

Fig. 4.—A "Simplex" Wiring Connector.

principals, the Ramie Union, Holland. These new connectors are of porcelain and are much stronger than the composition connectors previously inspected. They are also now made in two sizes; the "Simplex" (fig. 4) takes three 7/22 wires, and the smaller "Midget" type is for smaller wires.

Electric Blast Heater.

According to the *Electric Railway Journal*, the CONSOLIDATED CAR HEATING CO., Albany, N.Y., has marketed an electric air heater for cars. A motor-driven fan draws air in at one end of the heater and discharges it over the heating elements and out at the opposite end. The air inlet is covered with a brass screen to keep out foreign material and a damper is provided so that air can be taken from either outside or *inside* the car. It can be used as a ventilator at times when heat is not required. The blast heater ensures a uniform distribution of heat even if obstacles are placed in front of it.

Horn Switch Covers.

MESSRS. CLARKE & MORINI, Sentinel House, Southampton Row, W.C.1, have introduced a new form of cover for tumbler switches. This is of horn stamped to the standard shape, with a threaded hole in the centre. It is of very pleasing appearance, and should be of service in decorative schemes where fittings are required to harmonise with the furniture.

The firm informs us that the covers have been taken up by a number of switch manufacturers.

The Post Office and Automatic Telephones.

By Col. T. F. PURVES, O.B.E., M.I.E.E.

(Abstract of paper read before the INSTITUTION OF ELECTRICAL ENGINEERS.*)*

(Concluded from page 434.)

The Post Office was eager to start the introduction of automatics in London. The panel system was, therefore, very closely studied and the opinion reached was so favourable that it was decided to proceed as rapidly as possible with the preliminary arrangements for its adoption. It was admittedly both costly and complex; much design and engineering work still remained to be done before it could be said to have reached a state of comparative finality, and many of its features, which had been developed to meet the telephonic conditions of to-day in New York, could not without modification be applied to the very different conditions of London. On the other hand it was obviously a system of unbounded possibilities and no one doubted that it could be made to meet any legitimate service requirement that might arise.

Plans were prepared for a first panel exchange in London, "Blackfriars," and at the same time the Post Office started to negotiate an agreement with the Western Electric Co., in accordance with which the manufacture of panel equipment would have been commenced in England under conditions that would ultimately have permitted other British telephone manufacturers to obtain a share of the work. Early in 1922 the Automatic Telephone Manufacturing Co. called our attention to a notable development of the Strowger system by the Automatic Electric Co. of Chicago, which had succeeded in devising and combining with the step-by-step system a call-storing and translating scheme, which had endowed that system with practically the same elements of numbering and trunking flexibility that had first been conceived in association with the panel system. This new "director system" was of first-class interest and, although the immediate proposals were in a somewhat embryonic stage, they were at once invcstigated very fully.

In association with the Automatic Telephone Manufacturing Co. a miniature multi-exchange system was laid out in such a way as to cover as far as possible all the different types of service required and exchange conditions met with in London, and was installed at the General Post Office as a working model of the director system. (A similar working model formed part of the Post Office exhibit at the British Empire Exhibition at Wembley.) Exhaustive study and trial led to the conclusion that the director system contained all the essentials required as a basis on which to frame a complete equipment of circuits and apparatus admirably fitted for the service of such an area as London, and it was evident that a practicable alternative to the adoption of the panel system had become available. In November, 1922, I definitely recommended the adoption of the step-by-step system, with the addition of the "director." The main reasons on which that decision was based are as follows:—

(1) The first cost of director exchanges was somewhat lower than the probable cost of the panel system manufactured in England.

(2) The fundamental electrical plan of the system is very much simpler than that of the panel. Circuits for particular purposes are easier to design and easier to understand.

(3) The Post Office engineering staff was already familiar with step-by-step systems, and men could readily be trained to undertake all maintenance. The difficulties involved in securing and intensively training the requisite staff for handling the penal system—on the large scale of the necessary programme—would certainly have been considerable, and might have involved serious delay.

(4) The apparatus to be employed in the director system was all of existing types which had stood the test of years of actual use, and which could be depended upon to give first-class service. The scheme was purely one of new electrical circuits and combinations. It was possible, even at that early stage, to visualise the lines on which circuits for all purposes might be designed and, in fact, to see right through the eventual London system to a far greater extent than was possible in the case of panel equipment.

(5) The director system applied readily and naturally to small, as well as to large, exchanges and to "satellite" exchanges as well as main exchenges. The panel system had not been developed with a view to serving small or satellite exchanges. The fact that it could be made to do so was not doubted, but it did not appear that the solution was likely to be an economical one. This would be a matter of little importance in New York where nearly all exchanges must have a capacity approaching 10,000 lines. In the "down-town" area of New York many of the exchange buildings will have a capacity of four or more exchange units of 10,000 lines each. In widespread and less opulent London there have to be very small and satellite exchanges, and it is essential to have a system which can be applied economically to such conditions. It is estimated that in 10 or 12 years' time there will be at least 130 separate exchanges in the London area. Of these not more than about 50 will be in the business districts of the City and West End, and of this number only about 30 will have an ultimate capacity of 10,000 lines, while about 20 will be limited to 5,000 lines. The remaining 80 exchanges in the area will include about 50 of 3,000 lines, 20 of 2,000 lines, and 10 of 1,000 lines. In several cases two or three exchange units of 10,000 lines each will be accommodated in the same building.

(6) The Post Office was already committed to several variations of the step-by-step system on a considerable scale in the provinces. The possibility of using the same system in London replaced the somewhat dismal prospect of adding another and very complex system to the rather divergent group already established, by the much more attractive prospect of being able to standardise a type of automatic system for general use throughout the country. As a direct result of the adoption of the director system, a large measure of standardisation has since been accomplished. It will in future be possible to move staff from one district to another as may be necessary, without confronting the transferred men with unknown types of apparatus and circuits in the exchanges.

(7) Prior to the adoption of the director system, it had been ascertained that arrangements could be made for spreading the work among the regular exchange contractors of the Post Office at an early date. The important question of supply was thus greatly eased, as existing British factories became at once available for production purposes. The necessity for placing even the initial orders abroad was avoided, and the Post Office was able to enlist the co-operation of the skilled engineering staffs of all the contractors who had been producers of step-by-step equipment.

The negotiations in hand for the introduction of the panel system were therefore broken off and agreements were entered into with the Automatic Telephone Manufacturing Co. for the supply of director switching equipment for the equivalent of about 55,000 exchange lines, and with the Western Electric Co., Messrs. Siemens Brothers, and the General Electric Co. for smaller quantities. Provision is made for existing patents, and for future patents during a specified period, to be pooled on terms which will enable the Post Office to call upon all the firms to install plant covered by patents in the possession of any of them. At the end of the period of about three years covered by the contracts it will also be possible to utilise the services of other competent firms which may desire to manufacture step-by-step automatic equipment. These agreements cleared the way for standardisation of system.

Each contractor is allowed to supply plant of his own type of mechanical construction, but all types must be capable of operating in the prescribed manner on the circuits which represent, for the time being, the standard methods of fulfilling particular functions. It will therefore be possible to equip any area, large or small, with exchanges supplied by any contractors who may, from time to time, secure the orders for their installation. All our contractors are also encouraged to unify the mechanical details with a view to the gradual evolution of a fully standardised Post Office automatic system. Such standardisation has, of course, nothing whatever to do with any finality or fixation of practice. It simply means that at any given moment there is one standard way of making or doing any given thing. Improvements emanating from any source can be introduced on a systematic general basis which greatly facilitates effective progress.

Registration of a subscriber's calls is to be effected by a meter, with the normal exchange voltage behind it, wired to the "private" or test wire at the subscriber's rotary line switch, and linked up successively throughout all the switches used in a connection up to the final selector in the case of a local call, or to the outgoing circuit repeater in the case of a junction call. When the called subscriber replies, the operation of relays at the final selector or repeater applies a separate booster battery of 50 volts to the "test" wire in series with the main battery for about ¼ second. The meter operates on this and its armature remains attracted on the normal battery voltage—the test wire being normally earthed at the final selector or repeater. It is confidently expected that this method will give complete immunity from false registration.

Equipment for several large exchanges is now in course of manufacture, and in the cases of the Holborn exchange and the mechanical Tandem exchange the work of installation *in situ* has been commenced. It takes, under present conditions, about 6 months to plan the traffic and engineering details of a large automatic exchange, about 12 months to manufacture it, and a further 12 months, or more, to install it in position and tune up its circuits for service. It is impossible to standardise a single system without a certain measure of regret that features of great interest and utility associated with other systems have necessarily to be sacrificed. It has been decided to install a step-by-step automatic system in Berlin, and for the system of reconstructed exchanges which will replace those recently destroyed by the earthquake in Tokio.

The London subscriber will be required to signal 3 letters and 4 digits for each call, but the director can transform these

7 impulse trains into any number of directive trains from 5 to 10. This attainable maximum provides more than adequately for any possible future requirement of the London system, or any other system. The director consists of 9 switches with associated relays and a cross-connecting field; its operation can be studied with the aid of fig. 4.

The directors of each group are capable of serving 81 exchanges, and the total number of exchanges which could be served without mechanical modification of the directors is 648. This is so far above the number of exchanges ultimately required in London that the cross-connection field has been designed to serve 35 exchanges in each director group, or a total of 280. Even with this reduced number abundant spare space can be left, on the directors appropriated to each three initial letters, to avoid any restriction in the choice of exchange names on that account, although such restriction could easily be applied if necessary. Under average conditions a director to which properly graded access is provided will carry about 72 calls in the busy hour and will be occupied with each for about 20 seconds. To serve a busy city exchange the installation of from 150 to 180 directors is necessary.

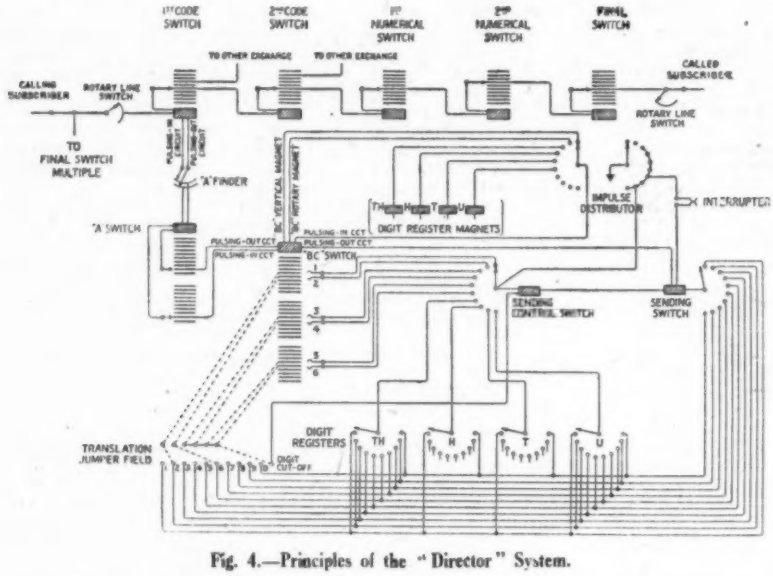


Fig. 4.—Principles of the "Director" System.

The actual circuit arrangement of the director system is necessarily somewhat complex; an innovation is the position of the battery feed to the calling subscribers, hitherto on the Automatic Telephone Manufacturing Co.'s system always located either at the final numerical switch or on the outgoing junction repeater. In the director system as adopted by the Post Office it will be located at the first code switch, thereby rendering outgoing junction repeaters unnecessary, except on tandem routes, and effecting a very appreciable economy in London and other large areas where the percentage of junction traffic is large.

Until the conversion of London to automatic working is fully completed (a period of from 15 to 20 years), traffic from automatic to manual exchanges will be handled by means of "call indicator" positions at the manual exchange, as illustrated in fig. 5. In its operating principles the system is similar to that invented for use in connection with the panel system, but the London system contains several novel features. It is a "coder call indicator system" and its object is to minimise the number of automatic switches necessary to display a call at a manual exchange, and to provide facilities for even traffic distribution of calls from all exchanges among the operators.

Each call indicator position is equipped with 36 cord circuits and it is expected that each operator will handle 450 calls during the busy hour. During the initial stages of automatic working over 90 per cent. of the automatically originated inter-exchange traffic in London will be handled at call indicator positions. This percentage will gradually decrease as more automatic exchanges are brought into use, and the wastage of call indicator apparatus will be minimised by the use in other large areas, such as Manchester, Birmingham and Liverpool, of equipment recovered from London exchanges, and probably much of it will remain in service during the greater part of its economic life.

To cater for traffic from manual exchanges, each automatic exchange will be equipped at the outset with a suite of cordless "B" positions equipped with key senders (see fig. 5), and when sufficient automatic exchanges in London are in use the cordless "B" and special "A" positions for operator service, &c., instead of being equipped in each automatic exchange, will be centralised, the centres being so chosen, to serve a group of adjacent exchanges, that economical use of line plant is achieved. There will be a number of such manual centres in London when the automatic traffic in the individual areas has reached a certain density. Great advantages in the design and cost of automatic exchange buildings will result from the centralisation.

In the London area there are a large number of comparatively small exchanges with small groups of junction lines to and from each of the larger exchanges, the busy-hour loads carried by these junctions being very low and their operation uneconomical. The installation of a mechanical tandem exchange has therefore been pressed forward, in advance of the completion of the first local automatic exchanges, in the same building as the Holborn automatic exchange. In it will be concentrated the outgoing and incoming junctions from the smaller exchanges as well as a number of junctions to practically all the other London exchanges, and for the period which will elapse before conversion to automatic working in London is completed it will be required to route traffic as follows:—

From manual exchange to manual exchange.

From manual exchange to automatic exchange.

From automatic exchange to automatic exchange.

From automatic exchange to manual exchange.

The method of handling this traffic is indicated in fig. 6.

A system of tone signals designed to give a calling subscriber knowledge of the progress of his call has been standardised for use both in London and the provinces. Before commencing to operate his calling dial the subscriber should listen for a "dial signal tone," which indicates that a free selector in the first rank—or, in London, an "A" digit switch—is available to receive the dialled impulses. If the called subscriber's line is engaged, or if, at any stage of the call, all outlets from a selector switch level are busy, a "busy tone" will be sent out. When dialling is completed the subscriber will receive "ringing tone" to indicate that the required subscriber is being rung, or "busy tone" to indicate that he is already engaged. In areas where the director is not used a "number unobtainable tone" will indicate to the subscriber that he has dialled a ceased or unallotted number. In London this tone will be used to indicate to a subscriber that he has incompletely dialled the required number. Calls for ceased or un-

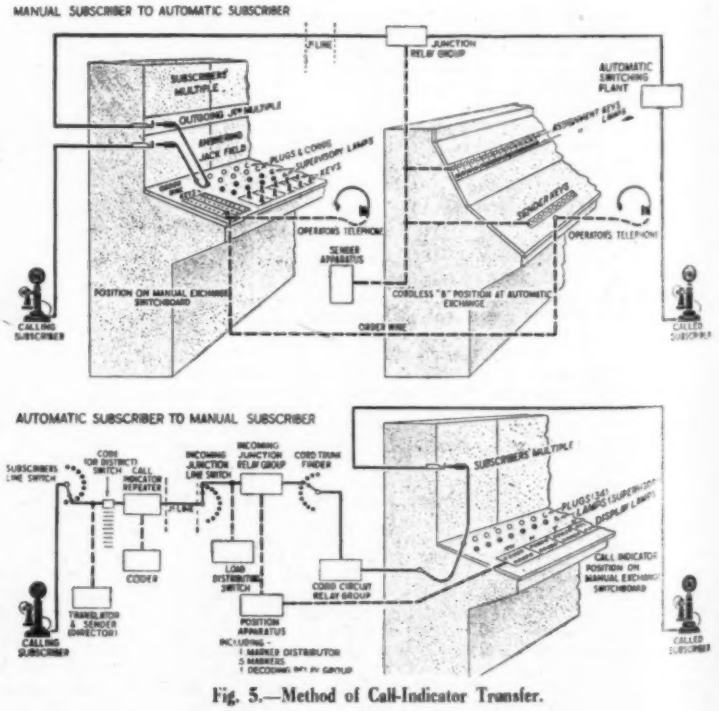


Fig. 5.—Method of Call-Indicator Transfer.

allotted numbers will be routed to an operator. When standardising subscribers' automatic equipment the standard common-battery telephone circuit was adhered to; a standard impulse and dial were also developed and fig. 7 illustrates the connections of the auxiliary contact springs in the new Post Office circuit, with 3-conductor cord; this circuit secures immunity from bell tinkling without biasing and reduces to a negligible quantity the high inductive dialling kick.

The economy which will be effected in London alone by obviating the need for fitting biased bells is estimated to approach £100,000.

The "message rate" tariff now in force in the British Post Office telephone service represents the only strictly equitable basis of general charge for such a service, inasmuch as each user pays for his service in proportion to the broadly averaged overall cost of providing it and the use he makes of it.

The argument that the general introduction of the automatic system will bring in new conditions which would justify the

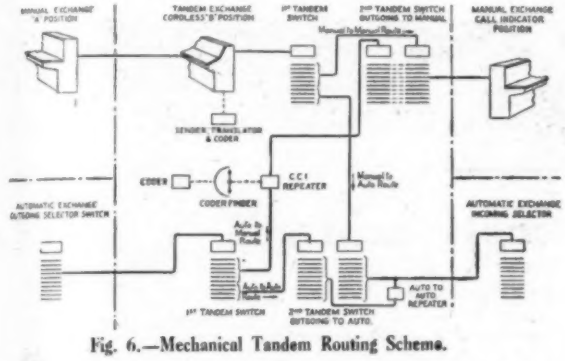


Fig. 6.—Mechanical Tandem Routing Scheme.

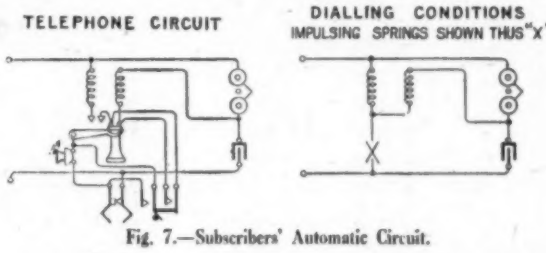


Fig. 7.—Subscribers' Automatic Circuit.

restoration of the "flat rate," which connotes a uniform charge to all subscribers of a particular class, independent of the number of calls originated by each of them, shows an entire misconception of the facts of the case. In a typical city manual exchange the ratio of individual to common service plant is about 1 to 2½; in an automatic exchange carrying equal traffic it is about 1 to 5. The actual cost per line of automatic plant in a busy city exchange is two or three times as much as in a suburban exchange forming part of the same system, but having an average calling rate proportionately lower. At present only the local unit fee per message is registered electrically on the subscribers' meters in automatic exchanges, and all charges for calls beyond the local fee area are manually recorded on tickets by operators. It is, however, probable that in the near future it may be convenient to extend automatic metering to calls for which double or treble the unit fee is chargeable, and so enlarge the effective areas to which a purely automatic system of working can be applied.

The cost of providing service to any subscriber depends upon the aggregate duration of his calls in the busy hour, and not upon their number. One call of an hour's duration will cost the system practically as much as 60 consecutive calls of 1 minute. Under automatic conditions there is much to be said for charging on a time-and-distance basis.

The scheme projected for the immediate future includes 32 new automatic exchanges in the London area with a total of 157,800 lines (the largest being of 10,000 and the smallest of 1,000 lines); in the 45 provincial areas there will be 129 exchanges (the largest area having 9 exchanges) with a total of 210,300 lines (the largest being of 20,000 and the smallest of 600 lines); extensions of existing provincial automatic exchanges will also be necessary in order to meet development.

The difficult matter of acquiring sites, at or near the positions indicated by economic studies of the area layout, and providing the necessary buildings, is proceeding as rapidly as present conditions allow. The contractors concerned in the manufacture of the exchange equipment are all working hard to produce and install the plant by the dates required, and the Post Office staff responsible for planning and providing the external cable plant, and for grafting it economically into the London cable network, are also working strenuously under conditions rendered more and more difficult by the rapidly increasing congestion of underground London and the necessity for reducing street openings to the utmost possible extent. In some central districts it is no longer possible to find space for the necessary cable ducts under footways and roadways, and tunnelling deep down in the London clay has to be resorted to in order to gain adequate access to exchanges.

It has been found desirable to set up a training school at the General Post Office for training the staff of the Engineering Department in the theory and practice of automatic telephony, and in the delicate work of switch adjustment, fault tracing, and cognate matters. Graduated courses of instruction are held for the skilled workmen who will actually maintain the exchanges, as well as for inspectors and engineers who will be responsible for the performance of the mechanism and the efficiency of the service rendered. The extreme complexity of modern automatic circuits and equipment is illustrated by the fact that a single automatic switching unit of 10,000 lines comprises no less than 5,000,000 "bank" contacts representing selectable outlets. Any one subscriber in such a unit can obtain connection with any other particular subscriber in the same unit *via* more than 240,000 different linkages. To reach all the subscribers on the unit he has at his disposal more than 2,400,000,000 different linkages—all without passing outside his own exchange of 10,000 lines. It is anticipated that, in the near future, an annual output of automatic equipment for a quarter of a million exchange lines will be producible in the factories of this country.

From the first inception of the Post Office telephone system it has been the policy of the Department to discontinue the purchase of telephone plant from abroad and to encourage the establishment, within the United Kingdom, of adequate manufacturing resources for the supply of all its needs. It was well recognised from the first that this would foster the setting up of a British industry which would cater for a far more extensive market than that represented by Post Office requirements, and the complete success of this policy is a matter for lively satisfaction.

The Ideal Home Exhibition.—III.

Win-Sum Electric Diffusers, Ltd.

This company's products have previously been described in our pages. They are, broadly, combined heating and ventilating devices. The standard cabinet form consists of electrical heating elements behind which is a slowly-revolving electric fan which forces air through the heater into the room in which the device is installed. The heating element can be replaced by a container filled with a deodorising medium. A new variation of the device is a diffusing unit consisting of a container mounted on an oscillating fan.

The International Electric Co., Ltd.

This company has an automatic telephone installation to which a number of the stands and the Exhibition offices are connected. A great deal of other telephone apparatus is on view, as well as hotel signalling systems and burglar alarm devices. The company's works and products were recently described in our pages (November 28th, 1924, p. 822). A new "ironclad" automatic telephone system for collieries is also exhibited.

Reliance Telephone Co., Ltd.

Various types of intercommunication telephones for large houses, offices, hotels, &c., are displayed upon this stand. Wall and desk patterns are shown and many of the instruments are designed to harmonise with styles of decoration. Throat microphone transmitters, signalling and bell apparatus, are also exhibited. The largest exhibits are two automatic exchanges for internal communication, one accommodating 50 lines and the other 25. A new form of burglar alarm is another feature of the stand. It is a closed circuit system, the final setting of which is made by closing the outer door of the building to which it is applied, the cessation of a buzzer indicating that the alarm is set. Interference with any part of the circuit upsets a relay controlling a bell which continues to ring until the relay is restored to its position.

The 25-line Peel-Conner "P. A. X.," which is shown, is a wall-pattern switchboard. All apparatus is mounted on a hinged steel frame, and is enclosed in a hardwood case with glass front. It therefore requires no special switchboard room, and all parts are easily accessible for inspection or repair. A combined "line and cut-off" relay has been designed, which is partially energised when a current is passed through the "line" winding, and operates those contacts which are ordinarily associated with the line relay. When the line has been picked up by the line finder switch and a current is passed through the "cut-off" winding, the relay is fully energised and operates all its contacts. The double-motion final selector switch, which is a feature of the equipments of 50 lines and over, has been dispensed with, and a 25-point rotary selector switch of the same type as the switch which is used as a call finder, has been substituted. The final selector circuit has been arranged so that the impulses received are cumulative, thus enabling the standard Post Office dial to be used.

Pathé of France, Ltd.

A model projector for domestic or industrial use is demonstated by this firm. This has been used to a great extent by industrial firms to show the manufacture of their products. It is a "lampholder" device and it is equipped with a small gas-filled lamp taking about .5 A. A development for use where a supply of electricity is not available consists of a small hand-driven magneto-generator bolted to the side of the projector. A "publicity" model is also available, this displays continuously a fireproof film 30 ft. in length, lasting from 2½ to 12 minutes, according to the subject. The picture obtained varies from 3 in. to 5 ft. in width.

Sheringham Daylight Development Co.

A number of lamps employing the "Sheringham" daylight screen or reflector are shown by this firm. The effect is obtained by means of a varicoloured reflector which abstracts from the light of an electric lamp a part of the red and yellow rays which brings it nearer to the light of a northern sky. One of the latest designs is the colour-matching arrangement shown in fig. 6, which is intended for use on a shop counter.

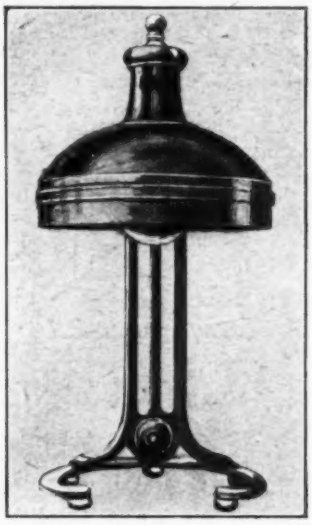


Fig. 6.—A "Sheringham" Colour-Matching Unit.

Delco-Light Co.

Examples of small generating sets are shown on this stand. The distinctive point in the design of these is that the engine and generator are enclosed in a single casing, while the controlling switchboard is mounted upon this. The result is a very compact arrangement which requires but little floor space. The sets are made in sizes of from 0.6 to 2.5 kW. Various patterns of the "Frigidaire" electrically-operated refrigerator are exhibited. As will be seen from the illustration (fig. 7), the design of this refrigerator, similarly to the "Delco-Light" plant, is very economical of space. The motor, compressor, condenser, and fan are mounted on a substantial base, which ensures silent operation. The motor is automatically controlled by a thermostatic arrangement which is operated by the rise and fall of the temperature ensuring that the motor is not kept running more than is necessary.

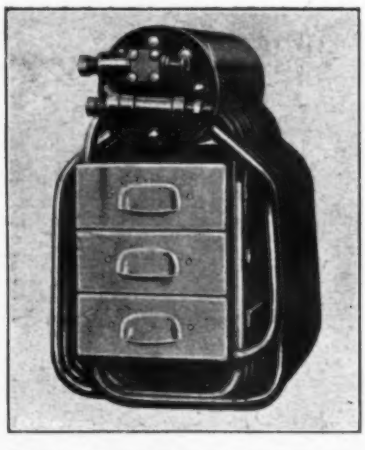


Fig. 7.—The "Frigidaire" Refrigerator.

Freezone, Ltd.

One of the principal appliances shown on this stand is the "Freezone" household refrigerating machine. This is a compact set driven by an electric motor of a very low rating. The principal improvement embodied in it is a device which ensures a fluid-tight joint between the rotating shaft and its bearings, thus eliminating stuffing glands with their attendant troubles. The refrigerant employed is sulphur dioxide, and the equipment is provided with a thermostatic control device to operate at from 8 to 12 deg. F. The refrigerating machine is placed in a specially-designed cupboard for installation in a kitchen.

L. G. Hawkins & Co., Ltd.

This company's exhibit was mentioned in our last issue (p. 423). We have now received a photograph of the stand which we reproduce herewith (fig. 8). Messrs. Hawkins have had an excellent display at previous exhibitions, but the one at present running at Olympia is decidedly the best that they have done so far.

Fig. 8.—Messrs. Hawkins's Stand.

G. W. Robinson.

The large self-contained electric fountain in the centre of the main hall and that in the E.D.A. garden were supplied by this firm. In addition to these the firm designed and supplied a special type of reflector for the lighting of the annexe. These reflectors are five feet square at the opening, two feet square at the top, and two feet deep, and each is fitted with three 300-W lamps. The firm has provided 36 of these reflectors, which are claimed to reduce the current consumption for lighting very considerably.

Read & Morris.

Radio apparatus of various kinds is displayed by this firm, including complete receiving sets. Among the components shown are dial condensers ("Eureka"). These are made with a maximum capacity of .001 mF; they are of the "square law" type, and are extremely compact, being concealed in a dial not much thicker than the ordinary condenser dial. They are claimed to be adjustable practically to zero. A new type of crystal detector is shown. This consists of a barrel in two parts joined together at the centre by a knurled coupling. The crystal lies in the centre of this coupling, being retained in position by a small spring plunger. In the periphery of the coupling is a chamber containing loose pins which fall towards the centre or recede as the coupling is rotated, making contact with the crystal. It will be seen that a fresh contact can be obtained by a small turn of the coupling. "Eureka" transformers, "C.A.V." and "Celestion" loud speakers, valves, &c., are also on view.

City Accumulator Co.

Radio apparatus of all kinds appears on this stand, including vario-couplers, filament rheostats, &c. A portable receiver which is shown is a 4-valve set in a neat leatherette case. The apparatus measures only 14 in. by 12 in. by 8 in. and weighs 16 lb. The aerial is concealed in the lid, and unspillable accumulators and the h.p. battery are fitted into the cabinet.

Other Exhibitors.

The following firms also showed devices of an electrical nature:—Astro Electric, Ltd. (silvered reflector fitting directly on a lamp, decorated lighting, glassware, &c.); John Richards and Co., Ltd. ("Delco-Light" sets and refrigerators); Radioco, Ltd. (loud speakers, headphones, valves, and other radio apparatus); J.W.B. Wireless Co. (crystal receiving sets, 'phone terminal blocks, &c.); Energo Products (l.f. radio transformers, &c.); British Vacuum Cleaner Co., Ltd. (vacuum cleaners and central vacuum plant); Beatty Bros., Ltd. ("Red Star" and "White Cap" washing machines); Betax Manufacturing Co. (small appliances, fans, violet-ray apparatus, &c.); Hurley Machine Co. ("Thor" washing machines); Hoover, Ltd. (vacuum cleaners); and Electrolux, Ltd. (vacuum cleaners).

Exports and Imports of Electrical Goods and Machinery in February, 1925.

As will be seen from our table there was a decline of £280,000 in the value of electrical exports during February as compared with the preceding month. It has to be borne in mind that the month was shorter, and, moreover, included five Sundays which would account for the greater part of the decline. Compared with the February of last year there was an appreciable increase of £194,000. The decrease in the total appears to be due mainly to the ever-varying factor submarine cable, which was £222,000 lower in value. Otherwise the increases and decreases were fairly evenly spread over the remaining items.

In the imports section similar factors operated, a fall of over £82,000 being recorded. This decrease was more general than in the case of exports, the increases affecting the total but slightly. Again, as compared with February, 1924, there was a considerable increase (£126,000). The largest proportional decrease in this section occurred in the item "Glow lamps," although "Batteries and accumulators" and "Insulated wires and cables" also experienced large decreases.

The re-exports section was affected in a similar way to the other two divisions; there was a decrease as compared with January, but a rise in comparison with February, 1924. There were large decreases in unenumerated electrical goods and apparatus, and machinery, but these were counterbalanced by higher figures for "Glow lamps" and "Telegraph and telephone wires and cable (not submarine)."

The totals for the two months all show increases in comparison with the first two months of 1924. The exports, particularly, show a satisfactory appreciation amounting to over £666,000.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Feb., 1925.	Inc. or dec. as compared with Jan., 1925.	Inc. or dec. as compared with Feb., 1924.	Electrical imports for Feb., 1925.	Inc. or dec as compared with Jan., 1925.	Inc. or dec. as compared with Feb, 1924.	Electrical re-exports for Feb., 1925.	Inc. or dec. as compared with Jan., 1925.	Inc. or dec. as compared with Feb., 1924.
Electrical goods and apparatus (unenumerated)	£164,371	+ £8,048	+ £27,614	£89,217	− £11,234	+ £11,589	£6,493	− £4,369	+ £1,911
Insulated wires and cables ...	253,887	+ 17,074	+ 21 844	41,558	− 13,695	+ 8,565	1,091	+ 78	+ 1,016
Glow lamps	49,418	+ 5,696	+ 26,994	26,173	− 10,003	+ 19,345	4,325	+ 4,098	+ 3,898
Arc lamps and parts	2,272	+ 2,032	+ 1,467	1,177	− 262	− 114	—	− 153	− 57
Batteries and accumulators ...	60,891	− 16,261	+ 22,220	50,576	− 17,068	+ 22,432	1,664	+ 1,140	+ 1,088
Meters and instruments ...	33,570	+ 15,915	+ 4,517	25,546	+ 5,562	+ 14,385	754	− 2,033	− 1,304
Carbons	529	− 3,551	− 4,172	4,838	− 2,769	− 9,125	444	+ 239	+ 423
Electrical Machinery—									
Electrical machinery (unenumerated)	222,106	− 18,186	+ 27,690	71,783	+ 7,804	+ 14,332	3,259	− 3,351	− 3,261
Railway and tramway motors	67,065	− 5,091	+ 36,533	—	—	—	—	—	—
Other motors and generators ...	195,357	− 63,473	+ 11,020	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	5,796	− 1,494	− 6,456	220	+ 145	+ 167	164	− 760	+ 164
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	81,752	− 2,462	− 9,223	15.324	− 1,279	+ 10,696	4,554	+ 4,448	+ 4,274
Submarine telegraph and telephone cable	51,186	− 222,330	− 3,235	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	259,413	+ 4,161	+ 37,624	88,599	− 39,713	+ 33,702	7,585	− 1,563	+ 4,657
Totals	£1,447,613	− £279,922	+ £194,437	£415,411	− £82,512	+ £125,977	£30,433	− £2,226	+ £12,809
Increases for the two months ended February, 1925		Exports. + £666,322			Imports. + £327,619			Re-exports. + £12,243	

Electrical Development in Residential Areas.

THE final E.D.A. salesmanship conference of the session was held at Caxton Hall, Westminster, on March 13th. Mr. E. Boys (Secretary of the North Metropolitan Electric Power Supply Co.) presided, and Mr. R. Hardie (of the Glasgow Corporation Electricity Department) read a paper on "The Development of Electricity Supply in Residential Areas."

A good deal was said with regard to the competition between gas and electricity, and Mr. Hardie did not agree with those who said there was a place for gas and a place for electricity, and that there should be co-operation between the two industries; electricity must proceed on its own, and, as the progress made must in a large measure be at the expense of its older opponent, the fight would grow keener. The proportion of electricity consumers to the total gas and electricity consumers in the towns and cities of this country, he said, was not much higher than 10, or at most 15 per cent., whereas in America, the Colonies, and other countries it was much higher. One explanation of the present position might be that engineers in the past had been fully occupied at the station end, endeavouring to cut generating costs to the irreducible minimum, to the comparative neglect of the distributing side, and the almost total neglect of the selling side. Generating costs were not the obstacle to a cheap supply of electricity to-day, but probably insufficient thought had been given to distribution. A new conception of the selling side, and the setting up of a proper sales organisation were needed. In Glasgow the proportion of revenue devoted to the selling side, allowing for newspaper advertising, cost of public exhibitions, electric home exhibits, and other special efforts, cost of running a showroom, and salaries of outdoor representatives, did not exceed £10,000 per annum, which was less than 1 per cent. of the gross revenue. No manufacturing firm could successfully develop its business on those lines, nor could electricity supply undertakings.

During the past winter there had been carried out in Glasgow a scheme for wiring houses on the hire-purchase system, payment being spread over three years. One factor which was an advantage there was the fact that the majority of the people lived in tenement houses, in which from 8 to 12 possible consumers could be supplied from one service cable, and the building line was upon the footpath. The supply undertaking's branch terminated usually 3 ft. within the entrance, and from there it was the endeavour to get the proprietor of the building to install a main rising cable to the top flat, complete with junction boxes on each flat, from which ultimately all tenants might obtain their supply. The usual cost of this work, consisting of cable in screwed steel tubing, was £9. In six months this rising cable had been installed at the proprietors' expense in over 200 tenements, so that facilities were available for about 2,000 tenants. The interior wiring of the flats was carried out at the tenants' expense. The objection was often raised by a tenant that he did not know how long he would continue to live there, but, in spite of that, during the six months from September, 1924, to February, 1925, 650 tenants had wired their houses under this scheme. Orders to a cash value of £9,000 had been placed with contractors, who did all the work. Under this scheme, in addition to lighting, a 5-A plug was installed in the kitchen for an iron, and a 15-A plug in all public rooms, to allow of the use of an electric fire, which could be hired, and the main rising cable was of a capacity sufficient to supply lighting, heating and cooking to every house in the tenement. For a two-room and kitchen house, with five lights and two plugs, the price was £8 10s. cash, or £9 10s. by instalments; for a three-room and kitchen house, with six lights and two plugs, the prices were £10 or £11 6s.; and for a four-room and kitchen house, with seven lights and two plugs, £12 or £13 14s. The prices included cord pendant and lamps. This was an attempt to bring electricity within reach of the poor, but the scheme had also brought numerous inquiries from owners of better-class houses, with the result that many of the latter had been wired also.

Alternatives to the Glasgow scheme were the simple hire system, in which a charge was made of so much per point per

annum, and the method of wiring houses "free of charge," the cost being recovered by imposing an additional charge per kWh. The main obstacle to the first was that in large cities the capital required to operate it was large, whilst the objection to the second scheme was that it involved differential rates, and the likelihood of the consumer keeping his consumption down to the minimum.

After stating that the hiring of fires was an economic proposition, he referred to the 200 electric houses which were already occupied in Glasgow, and the 600 in course of erection. These contained one coal fire only, in the living room, which also provided hot water. In other rooms, which contained no fixed fireplaces, there were electric fires, and the houses were provided with an electric cooker and wash boiler. There was no undue trouble with apparatus, and the consumers were satisfied. There was a fixed annual charge of 12½ per cent. of the rental, plus ½d. per kWh for current consumed. Two demonstration electric houses which were built three years ago had been inspected by over 20,000 people in three weeks, and that was perhaps the most successful propaganda effort in Glasgow to date.

In conclusion, he made another appeal for the setting up of properly staffed organisations on the commercial side, with remuneration and prospects which would attract the right men.

Discussion.

In opening the discussion, the Chairman said that all public utility undertakings had an annual turnover of about 25 per cent. upon their capital expenditure, and certainly never more than 30 per cent., whereas shopkeepers reckoned to turn over their capital five or six times per annum. It was important, when capital charges had to be met, that prices should not be cut too low in relation to production costs. Electrical demonstration houses were far more valuable from a publicity point of view than a well-equipped showroom.

Mr. J. Leadbeater (Hampstead) spoke of the success which had attended a free wiring scheme in Hampstead, which had been in operation seven months, and had resulted in the connection of 450 new consumers. The charge for energy covered the cost of wiring, and there was a minimum quarterly charge. Consumers could purchase their installations at any time at cost plus 10 per cent. The cost was met by the reserve fund, and the installations would pay for themselves in about eight years.

Mr. C. H. Rayner (Manchester) asked Mr. Hardie from whom he expected to recover the balance if a tenant who had committed himself to three annual payments had left his house before those payments were completed. He also raised the question of ventilation in houses where there were no chimneys, and asked how that was provided for.

Capt. R. M. Moberley said the use of more fires imposed an additional load on the supply station, and asked how the increased peak load was dealt with.

Mr. W. A. Gillott said that it would be of great advantage if station engineers now devoted as much time to commercial development as they had to the supply station end in the past.

Mr. G. L. Garton (Ipswich) said that a wiring system on a rental basis had been a commercial success at Ipswich, and had been a great help from the point of view of output; over 1,000 consumers had adopted it in 16 years. In many cases the whole of the initial outlay on the wiring (installed before the war) had been covered in rental at present. Purchase facilities were given, the purchase price being reduced in accordance with the rentals paid. Not more than four of these installations had been removed owing to new tenants wishing to discontinue them, and at no time had there been more than ¼ per cent. of the installations which were not producing revenue. A great deal of apparatus had also been disposed of by hire purchase.

Mr. H. King (Ilford) pointed out that the majority of urban district authorities had not powers to sell apparatus; he urged that something should be done to give these powers to local authorities so handicapped, so that it should not be necessary for each authority individually to go to the expense of obtaining them. A scheme for carrying out installations on a rental system had been successful at Ilford, and in two years there had been about 300 such installations, at a cost of roughly £3,000. Maintenance costs had been small. The work was done by contractors.

Mr. F. T. Hall (Tottenham) suggested that in intensive national campaign could be carried out if supply authorities increased their subscriptions to the E.D.A. He attributed the great development of electricity in Amsterdam to the fact that municipal authorities were able to install small sub-stations in kiosks in the city, and he advocated this system of installing small sub-stations as and when they were required.

Mr. F. Howell complained that some supply authorities did nothing to help consumers, and asked how electricity was to be developed in residential areas under those conditions.

Mr. Hardie, replying to the discussion, said that, in Glasgow, services to supply private houses where there was a garden in front were not laid free, as in the case of the tenement buildings. No meter rent was charged. In a small area free wiring might be feasible, but in large cities it would involve too great a capital expenditure for the undertakings to meet. He had not had trouble as the result of new tenants refusing to take over hire-purchase installations, and did not anticipate it. In all-electric houses the ventilation question was not a serious problem. There was a small ventilating flue, and the saving effected in building a house by reason of the absence of chimneys and fireplaces was about £30 or £35. There were no difficulties in Glasgow with regard to the peak load as the result of the installation of electric fires and cookers, because development at present was taking place in the outlying districts, where the distributing facilities were ample, but it had also arisen in the centre of the city. All the fires and cookers were not on at the same time, however. In reply to Mr. King, he said every undertaking had hiring powers, and a good business could be done in that direction.

Parliamentary.

(By Our Special Parliamentary Reporter.)

Advertising the Telephone.—Dr. Clayton, M.P. for Widnes, has given notice of the following motion:—That in the opinion of this House the Post Office should be urged and encouraged to increase its revenue-earning power by adopting a long-sighted programme of telephone development, and by using commercial methods of informing the public fully, frequently, and persistently of the value, advantage, and cost of telephone facilities, thus increasing the demand for such facilities. Further, that in the opinion of this House such a programme will benefit the national revenue, will favourably affect employment in a wide range of industries, and will provide an impetus to the development of trade and industry generally throughout the country.

Empire Wireless.—On March 10th, Sir Wm. Mitchell-Thomson, Postmaster-General, informed Sir H. Brittain that the high-power wireless station which was in course of erection at Rugby was expected to be completed in about eight months' time. A smaller station for communication on the "beam" system with a similar station in Canada was expected to be completed in September or October next. Orders would be given for the erection of additional "beam" stations for communication with India, South Africa, and Australia as soon as definite arrangements had been made by the Indian and Dominion Governments for the erection of corresponding stations in those countries, and search was now being made for a suitable site for the purpose.

Replying to Mr. Ammon, Sir W. Mitchell-Thomson said that permission had been given to the Marconi Company for the erection of a group of "beam" stations near Dorchester for communication with the United States and with South America, but the terms of the licence to be granted for the stations were still under discussion with the company.

The Gretna Plant.—On March 10th, Mr. Guinness, the Financial Secretary to the Treasury, informed Mr. Hardie that the electrical generating plant at Gretna, which was intended for manufacturing purposes, was quite unsuitable for the present limited requirements. Negotiations were being conducted with persons locally interested, on the basis that they should obtain a small generating plant and acquire from the Government such distributing cables, &c., as would be necessary for the supply of electricity to houses.

Railway Electrification.—On March 10th, Mr. Hannon asked the Minister of Transport whether, having regard to the provisions of the Railways Act, 1921, he could state what contracts for electrification had been placed by the four railway company groups since grouping was completed; and what proportion of the amount of such contracts had been placed in foreign countries.

Colonel Ashley said he was not in possession of the information required. He was informed by the Trade Facilities Act Advisory Committee, however, that in connection with the electrification of the South-Eastern and Chatham Section of the Southern Railway contracts for rather more than £2,500,000 had been placed up to the present time, and that none of those contracts had been placed abroad.

Fog Dispersion.—On March 11th, Captain A. Evans asked the Secretary of State for Air whether he was willing to carry out experiments over London in fog dispersion; and if his attention had been drawn to reports of alleged success by the American air service with sand electrically charged from aeroplanes.

Sir S. Hoare said that the progress of the American experiments, which were, it was understood, of a private nature, had been reviewed by the Air Ministry from time to time. Scientific opinion, both in England and America, was not, however, convinced that the experiments were based on sound principles, nor satisfied with the evidence of success so far made public, and the Air Ministry could not, therefore, advise the undertaking of the necessarily expensive tests involved.

Ipswich Corporation Bill.—This general powers Bill was considered by a House of Lords Committee on March 12th and 13th. The only section to which there was opposition was that in which the Corporation seeks power to convert the existing tramways to railless traction, and to run railless trolley vehicles over routes not at present served by the tramways. The latter clause was opposed by the Eastern Counties Road Car Co., Ltd., which maintained that the railless cars would be subsidised by the rates, setting up unfair competition with the company's omnibuses.

SIR LYNDEN MACASSEY, K.C. (for the Corporation), said that the total length of track was about 10 miles and during the war repairs had had to be deferred. In consequence it had become necessary not only to replace the rails but to reconstruct the whole of the foundations. As this would have cost £156,000 the Corporation decided that it would be cheaper to convert the system for railless trolley traction. Experiments had proved that by this means the fares could be reduced with satisfactory results. Mr. A. Baker (general manager of the Birmingham Corporation Tramways) had advised the conversion, and the extension of the system beyond the existing termini. The company's omnibuses did not by any means serve the public needs inside Ipswich.

Several witnesses were called in support of the Bill. Mr. A. S. Black, M.I.E.E. (chief engineer and manager of the Ipswich Corporation Electricity Supply and Tramway Departments), gave estimates of the financial results which were anticipated to be satisfactory. He said that the cost of converting the existing tramways would be £69,500 and the cost of the extensions £34,800.

MR. W. E. TYLDESLEY JONES, K.C. (for the company), said that the Corporation only sought borrowing powers up to £69,500; the money required for the extensions could only be obtained by application to the Ministry of Transport. This was an unusual procedure where specified routes were being dealt with.

MR. A. BAKER said that it was not reasonable to expect that the traffic would be sufficient to cover the additional capital charges which would be involved in the reconstruction of the existing system. Cross-examined by Mr. TYLDESLEY JONES, he said that there were a number of local authorities who would be well advised to run railless trolley vehicles rather than tramcars. On the other hand, where there were large volumes of traffic on arterial thoroughfares nothing could compete with tramways.

Counsel pointed out that Ipswich would still be saddled with the debt on the tramways for another 20 years in addition to the cost of the railless system. He criticised Mr. Baker's figures relating to repairs and maintenance, stating that they were lower than had appeared in practice in Leeds and Bradford. He suggested that the only railless trolley undertaking which was meeting all expenses was that at Birmingham. Mr. BAKER replied that there were others, including Wolverhampton.

The Committee then adjourned until March 16th, when Mr. TYLDESLEY JONES stated that the present tramway system had been a burden to the town, and there was nothing in the evidence to show that the railless system would be remunerative. The company already afforded facilities which could be extended when necessary. After hearing witnesses for the company, the Committee again adjourned until the following day.

At the conclusion of the evidence the Committee found that the preamble of the Bill was proved.

Correspondence.

Correspondents should forward their communications* at the earliest possible moment.** ***No letter can be published unless we have the writer's name and address in our possession.

German Terms.

With reference to Dr. Grunwald's letter in your current issue, I think it will be agreed that the Leipzig Fair is *primarily* an industrial fair (just as our British Industries Fair), although *part* of it is given over to technical matter. I did not say in my letter, or suppose, that "no technical fair" took place there. Therefore in advertising it in a non-technical sense *on a hoarding* the word "industrial" should be used, and I maintain that the German expression "technische Messe" is intended to mean primarily in this case industrial fair and not necessarily a technical fair. A technical fair can be included in an industrial fair, but not *vice versa*.

I did not say that the word "technisch" was *synonymous* with "industriell"; I said that it could have two different meanings, "technical" or "industrial" (in English), and I still maintain that this is so; and Dr. Grunwald, in saying that I am incorrect, does not explain what "technical surfaces" or "technical gases" are. I may be wrong in regard to what the German Chancellor meant (we do not know what our own politicians mean, let alone foreign politicians), but if he meant what Dr. Grunwald says, I still maintain that the English translation did not mean it, and it should have been put differently. This illustrates my contention that the word "technisch" cannot be translated literally into English in all cases.

In looking through a recent English book on Applied Electrochemistry by Allmand and Ellingham, in which references to German journals are frequently made, I came across the following, which were no doubt translated verbatim from the German:—

Page 169—technical primary cells.
Pages 178 and 181—technical furnaces.
Page 233—technical cell.
Page 247 (first and last lines)—technical accumulators.
Page 275—technical current densities.

There is, no doubt, a "Technik" (technique) in making saucepans, but yet it could not be said (in English) that "technical saucepans" are sold at the Leipzig Fair; yet if the word "technisch" cannot mean "industrial" in some cases, technical saucepans, technical accumulators, technical furnaces, &c., are sold there, and the current densities employed there are no doubt "technical" also. There is, I believe, such a thing as "technical nonsense," but perhaps Dr. Grunwald will agree with me that it occurs more often in English than in German.

D. V. Onslow.

London, *March 9th*, 1925.

Lead-covered Wiring and Visible Bonding.

I have been very interested in the above controversy, and whilst I cannot agree with some of your correspondents I do with others.

I do not agree that visible bonding is necessary, as this would rob the whole system of one of its main advantages, that is, neatness; but I do agree that good bonding is necessary. But whatever system is used, a good deal, in fact nearly everything, depends on the workman, who can by carelessness ruin nearly any job.

Replying to "G. T. C." in your issue of February 27th, I would refer him to the boxes made by Messrs. Johnson and Phillips, which are very roomy and will either allow of a sound joint or the insertion of porcelain connectors, and further, these boxes are fitted with a substantial bonding clamp. If the smallness of the junction boxes is the only complaint "G. T. C." has to make, I feel convinced the above make will get him over his difficulty.

The Walsall bonding arrangement is a good job, but the boxes are small.

Harry Moss.

Bradford, *March 9th*, 1925.

Low-fall Hydraulic Turbine Installations.

We notice in a description of the Ringwood hydro-electric station, appearing in your issue of the 20th ult., a statement that that station was believed to be unique in that it was working on a fall of only 4 ft. of water. It is curious that this statement should have been made when only a few miles away on the same river at Christchurch there has been working for 18 months or more an installation of four turbines of about the same physical size, giving 33 h.p. each under a head of 3 ft. The turbines are designed to operate down to a head of 1 ft., and at the moment are operating on a head of 2 ft. The plant is the property of the West Hampshire Water Co., and the turbines have been supplied by us.

Boving & Co., Ltd.
H. D. COCK, *Director.*

London, *March 11th*, 1925.

Russian Electrical Notes.

The Situation of the Manufacturing Industry. — The board of the State Planning Commission received a report early in February from the Industrial Section with regard to the productive and financial plan of the electrical industry for the current year (1924-25). The report stated that during the year ended September last 26 manufacturing works were in operation employing 14,382 workpeople. The general value of the production on the basis of the delivery prices amounted to 43,500,000 roubles and the profits were 2,800,000 roubles. In the current year there were 25 works in activity with a total number of 15,427 persons employed. The value of the output for the year was estimated at 52,000,000 roubles. The working capital of the industry was computed at 40,800,000 roubles, and the indebtedness at the beginning of last October amounted to 27,700,000 roubles.

Notwithstanding the productive achievements, the report states that the industry has a number of defects. Work between the different trusts is not in agreement; the technical work of one trust is kept a secret from the others; and there is no connection in relation to the working out of standard types of machines, accessories, &c. The distribution of the production of the same articles induces unsound competition, and the load on the works of the different trusts is insufficient. The efficiency of labour is low and the wages paid are high. In addition, the sale prices of the manufactures are much higher than those of foreign firms. As a result of these conclusions, the Supreme Council of National Economy, it is urged, must take into consideration the question of the radical reorganisation of the electrical industry by the amalgamation of the trusts. The board of the State Planning Commission has decided that the reconstruction of the trusts is necessary and is to put the matter before the Council of National Economy.

The Situation of the Tramways.—At a Pan-Russian tramway congress held in Leningrad early in February, it was stated that there were not many branches of national industry in which the diversity of equipment was so considerable as in the tramway industry. The result was that the conditions of working and repair were very difficult, the working expenses were high, and great difficulties were encountered in placing orders with the works owing to the hindrances in the way of the execution of an inconsiderable number of different articles. The conference confirmed a number of standards prepared for rails, axles, tires, wheel centres, &c., and gave instructions for

further work to be carried out in the direction of standardisation. It was stated that a great improvement had taken place in the past two years in the tramway industry. Some tramways, as, for instance, those in Moscow, Nischni Novgorod, Kharkoff and Tver, were transporting more passengers than before the war. In most towns the restored tramways did not keep pace with the growth in the traffic requirements of the population, and as a consequence the cars were overcrowded. The problem which confronted industry on the one hand and the local authorities on the other was to place in service in the next year or two 1,000 new cars, to obtain 2,000 traction motors, 16,000 tons of rails, 2,500 crossings and points and a great deal of auxiliary material. It was considered to be necessary for the industrial works not only to produce this material, but also improve the quality of the products, which were declared to be unsatisfactory. In the case of traction motors it was stated that the two electrical trusts were working out new types of motors with the improvements suggested by American and European practice.

The financial problem was said to be more complicated than the technical side of the question. It was estimated that the expenditure on the proposed improvements would amount to from 20,000,000 to 25,000,000 roubles, but not more than 30 per cent. of this amount could be provided by the local industries and the tramway undertakings, while the remainder would have to be supplied in equal parts in the course of the next three or four years. It was concluded that the only way of finally restoring and developing the tramway industry lay in the organisation of credits inside Russia and by, if possible, securing the participation of foreign capital in the form of money or goods on credit.

Extensions in Leningrad.—The Electrical Planning Commission has approved the estimates submitted by the Elektrotok, or union of the supply undertakings in Leningrad, for the year 1924-25. The estimates provide for an expenditure of 3,181,000 roubles on new equipment and repairs.

The Leningrad Electroforce Works.—The director of the Electroforce Works, of Leningrad, states that owing to the growth in the demand it is necessary to increase the productivity of the works to the maximum. Positive results in this respect were achieved in the quarter ended with last December, when the value of the output amounted to 1,044,000 roubles or an increase of 352 per cent. over the value in the corresponding period of 1923, but only forming 71 per cent. of the production in the final quarter of 1913. The chief causes of the improvement are stated to be the introduction of more precise estimates and the increase in the wages of the men, these having been advanced by 35 per cent. during the year. The number of persons employed has risen from 750 in October, 1923, to 1,350 at the end of December, 1924, and a further addition of 400 men is to be made in the next few months. A further development of the production is expected to result from the installation of new machinery and from the reorganisation of the productive departments for machines, transformers, apparatus and accessories.

The General Electrification Scheme.—The electrification section of the State Planning Commission has received a report by Prof. Shulgin on the necessity for revising the large scheme of electrification which was decided upon over five years ago. According to the professor, the past five years have brought about great alterations in the economic bases upon which the scheme was founded. A number of stations which were considered in the original scheme to be of regional importance have turned out to be only of local significance, while local stations have become of regional importance. The latter is the case in the district of Baku owing to the restoration of the oil industry. On the other hand, the Kizeloff station has lost its "regional" importance through the cutting out of Kizeloff coal by Kuzenetz and Ural coal. The revision of the scheme has also to take into consideration the economic problems which have arisen in the past five years, particularly the utilisation of the riches of Siberia and the export through Leningrad of the agricultural and rural industrial products of Siberia, and timber from the Ural.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

21,117. "Wireless apparatus." A. Compare, L. T. M. Pennington, and B. Alexander. August 20th, 1923. (229,355.)

21,118. "Wireless apparatus." A. Compare. August 20th, 1923. (229,356.)

28,637. "Dynamometers." L. F. R. Fell. November 13th, 1923. (229,369.)

28,752. "Automatic or semi-automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd., and J. E. Ostline. November 14th, 1923. (229,371.)

28,753. "Arrangements for charging electric accumulators." Automatic Telephone Manufacturing Co., Ltd., and C. Remington. November 14th, 1923. (229,372.)

28,983. "Means for obtaining records for electrical measuring instruments." Landis & Gyr Akt. Ges. November 17th, 1922. (207,193.)

29,010. "Television." E. Belin. December 27th, 1922. (209,049.)

29,011. "Dynamic model of a thermionic valve circuit." British Thomson-Houston Co., Ltd., and R. C. Clinker. November 16th, 1923. (229,374.)

29,199. "Loud speakers." H. J. Round. November 19th, 1923. (229,382.)

29,335. "Contacts as used in electric starting switches, controllers, and like apparatus, particularly of the drum or rotary type." E. Long. November 21st, 1923. (229,387.)

29,361. "Control of electric sub-stations." A. Reyrolle & Co., Ltd., B. H. Leeson, and R. C. Minton. November 21st, 1923. (229,388.)

29,374. "Electric switches for electromagnetic sound-producing horns." W. J. Spicer. November 21st, 1923. (229,392.)

29,394. "Thermionic valve radio-receiving sets." W. J. Rickets. November 21st, 1923. (229,394.)

29,758. "Wire screens suitable for use with electric and other heating devices." A. F. Berry. November 26th, 1923. (229,408.)

29,887. "Systems of electric ship propulsion." British Thomson-Houston Co., Ltd., and D. E. Jewitt. November 27th, 1923. (229,410.)

29,915. "Globe fittings for electric lamps." W. McGeoch. November 28th, 1923. (229,411.)

29,927. "Battery connections or holders." C. B. Smith. November 28th, 1923. (229,413.)

30,132. "Electric discharge devices." British Thomson-Houston Co., Ltd. November 29th, 1922. (207,816.)

30,142. "Variable electric condenser." M. R. Turner. November 30th, 1923. (229,416.)

30,307. "Electric furnaces." British Thomson-Houston Co., Ltd. December 1st, 1922. (207,823.)

30,365. "Volt-ampere meters." E. W. Moss (Lincoln Meter Co., Ltd.). December 3rd, 1923. (229,420.)

30,884. "Electrical testing apparatus for fluid-pressure engines." Highfield Electrical Co., Ltd., F. W. Highfield, and H. E. Taylor. December 8th, 1923. (229,427.)

31,248. "Thermionic valves." Edison Swan Electric Co., Ltd., and T. W. Price. December 12th, 1923. (229,429.)

31,944. "Electrolytic cells for refining metals." Aluminum Co. of America. December 21st, 1922. (208,710.)

31,954. "Methods of operating and lining electrolytic cells for electrolytic refining." Aluminum Co. of America. November 30th, 1923. (225,494.)

32,170. "Igniting apparatus for internal-combustion engines." G. M. Blackstone, F. Carter, and E. Carter. December 22nd, 1923. (229,437.)

32,279. "Electric generating plant for constant-current systems." G. Austin, J. C. Macfarlane, and W. A. Macfarlane. December 27th, 1923. (229,440.)

32,444. "Current distributors for the ignition systems of internal-combustion engines." J. Higginson. December 28th, 1923. (229,442.)

1924.

312. "Method for regulating the strength of the current-traversing rectifier and devices for carrying out said method." P. M. G. Toulon and Soc. De Recherches et de Perfectionnements Industriels. January 4th, 1923. (209,426.)

476. "Device for locking electric lamps." W. E. F. Fitzgerald. January 7th, 1924. (229,447.)

494. "Electric safety lamps, particularly miners' hand lamps." G. I. Harris and T. Knoyle. January 8th, 1924. (229,448.)

1,164. "Electrical condensers." A. E. Watkins. January 15th, 1924. (229,458.)

1,240. "Trolley heads for electrically-propelled vehicles." J. W. Thorpe. January 16th, 1924. (229,459.)

2,206. "Rotary current motors." A. R. M. Sankey. January 28th, 1924. (229,470.)

2,450. "Wireless apparatus." Burndept Ltd., and C. F. Phillips. January 30th, 1924. (229,473.)

3,361. "Head attachment gear for telephone receivers." British Thomson-Houston Co., Ltd., and A. P. Young. February 8th, 1924. (229,479.)

3,442. "Automatic telephone switches and systems." D. S. Hulfish. February 9th, 1923. (211,152.)

3,977. "Electric transformers." F. E. Berry and A. F. Berry. February 15th, 1924. (229,484.)

4,022. "Rheostats." G. M. Bowles. February 16th, 1924. (229,485.)

4,085. "Electric batteries with switchgear." E. C. Avery. February 16th, 1924. (229,486.)

4,514. "Electricity meters." Chamberlain & Hookham, Ltd., and S. H. Holden. February 21st, 1924. (229,490.)

4,909. "Electric discharge devices." British Thomson-Houston Co., Ltd. February 26th, 1923. (211,893.)

5,664. "Telephone repeater and like systems." Western Electric Co., Ltd. April 30th, 1923. (215,323.)

5,801. "Means for preventing double connections in relay switches suitable for use in telephone systems." Relay Automatic Telephone Co., Ltd. March 12th, 1923. (212,900.)

6,275. "Spark plugs for automobiles." G. H. Ricke. March 11th, 1924. (229,505.)

6,495. "Couplings or joint boxes applicable to electric cables and conductors." R. J. Brown and D. M. E. Bevan. March 13th, 1924. (229,506.)

6,513. "Electrical control systems." R. Brooks and Metropolitan-Vickers Electrical Co., Ltd. March 13th, 1924. (229,507.)

8,716. "Electrically-operated recording musical instruments." H. Wade (Mills Novelty Co.). April 7th, 1924. (229,523.)

10,859. "Electric wave producers." Western Electric Co., Ltd. October 16th, 1923. (Addition to 213,562.) (223,530.)

11,732. "Terminals for electrical conductors." E. L. Wiegand. May 12th, 1924. (Addition to 219,084.) (229,533.)

11,815. "Automatic electric generating system." H. F. Carpenter. May 13th, 1924. (229,534.)

13,406. "Suspension devices for railway, tramway, or road vehicles." H. S. Swift. May 31st, 1924. (229,543.)

13,641. "Electrical switches." H. B. Old. July 4th, 1924. (229,544.)

14,387. "Electric heating apparatus." J. Wangler Ges. June 27th, 1923. (Addition to 213,897.) (218,273.)

15,925. "Electric meters." British Thomson-Houston Co., Ltd. July 3rd, 1923. (218,690.)

17,345. "Electric maximum cut-out." O. Houdek and F. Houdek. July 19th, 1924. (Convention dated not granted.) (219,969.)

17,353. "Electric safety device." M. Paul. March 13th, 1924. (229,564.)

17,763. "Electric locomotives and other electrically-propelled vehicles." A. H. Jackson. July 25th, 1924. (229,569.)

20,470. "Wind-driven electric generators." T. Wolk. December 5th, 1923. (225,815.)

22,078. "Apparatus for converting electric currents." M. De Coninck. September 18th, 1924. (232,135.)

23,381. "Lamp globes." British Thomson-Houston Co., Ltd. October 3rd, 1923. (222,880.)

24,235. "Measuring high-voltage from the low-voltage side of load transformers." International General Electric Co., Inc. November 15th, 1923. (224,873.)

26,538. "High-frequency electric signalling systems." British Thomson-Houston Co., Ltd. November 6th, 1923. (224,542.)

29,589. "Telephone exchange systems." Western Electric Co., Ltd. (G. Deakin). September 11th, 1923. (Divided application on 226,265.) (229,591.)

29,882. "Electric vacuum tubes." Dr. H. Konemann. October 12th, 1923. (Divided application on 226,902.) (229,232.)

1925.

1,085 "Method of fixing the connection wires of electric batteries." British Thomson-Houston Co., Ltd. January 21st, 1924. (228,147.)

Cotton Mill Machinery.—According to *The Textile Recorder*, in connection with cotton mill machinery, it requires about one i.h.p. to drive 45 slubbing frame spindles, or 60 intermediate frame spindles, or 75 roving frame spindles, or 100 jack frame spindles.